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EDITORIAL NOTICE.

The Archives of Ophthalmology is a bi-monthly journal, published in annual volumes of about six hundred pages each, extensively illustrated with cuts in the text, half-tone text plates, and lithographic plates.

About three quarters of the space is devoted to original papers, and the remaining quarter to a systematic report on the progress of ophthalmology, and to reports of societies, book reviews, and miscellaneous notes, all of it original.

The papers and reports are original and accepted only with the understanding that they are to be published in this journal exclusively.

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ARCHIVES OF OPHTHALMOLOGY.

SHOULD WE STILL CONSIDER THE OCULAR TENSION AS BEING DUE TO THE AQUEOUS HUMOR? THE OCULAR TENSION AFTER PUNCTURE OF THE ANTERIOR CHAMBER OR PRESSURE ON THE EYEBALL.¹

BY DR. A. P. MAGITOT, PARIS.

(With seven illustrations in the text.)

HAVING studied, with Mestrezat, the chemical modifications of the aqueous humor of second formation, I have undertaken on my own behalf a series of researches concerning the ocular tension after puncture of the anterior chamber. This particular point of ocular physiology had not yet been studied fully (Bonnefon) in spite of the interesting data which it could furnish on the liquids and circulation of the eye. The only theory advanced was that the ophthalmotonus reconstituted itself fairly rapidly (in 1 to 2 hours) in man, but that there might be variations due to the conditions of the subject (Wessely-Seidel).

I have made use of both animals and man, as subjects of study. On the former, I registered the modifications of the tension with a manometer; on the latter I was obliged to content myself with the tonometer. What follows will however prove that the effects obtained are comparable in all respects.

¹Paper read before the Soc. d'ophtalmologie de Paris, March-April, 1922.

So as not to report the detailed account of thirty experiments, I have classified them into three groups each of which represents a definite type:

EXPERIMENT TYPE A.—Chloralosed dog. The needle of the ocular manometer is in the right anterior chamber. The blood pressure is measured from the left carotid (Fig. 1).



FIG. 1.—Chloralosed Dog. Mercury manometer connected with the R. anterior chamber. Another manometer in connection with the left carotid artery is used to take record of the general blood pressure. The ophthalmotonus was of 30mm Hg. After withdrawal of the aqueous (arrow P) it fell to 0, but very soon began to rise. In a few minutes it reached 52mm and the descent began slowly. The return to the original figure needed 48 minutes. Total time of the record = 1 hour, 5 minutes.

Three minutes approximately after having introduced the canula needle into the anterior chamber and after having registered the tension, a small needle five tenths of a millimeter is introduced very obliquely into this same anterior chamber and the aqueous humor is slowly extracted. As soon as this needle is withdrawn the ocular tension falls to zero. This state lasts, according to the animal, from 5 to 10 minutes and then the tension slowly rises to 6mm and then to 10mm . When it reaches the neighborhood of this figure the ophthalmotonus increases rapidly. The initial tension is very rapidly reached and passed. With every movement of expiration a sort of wave of hyperpressure is produced. When it has reached from 40 to 50mm Hg the ascensional movement stops, and then after a few minutes it begins to descend fairly rapidly (less rapidly, however, than during its ascent) and finally returns to the original figure.

The whole of this phenomenon does not last more than

half an hour, time being calculated from the moment of puncture.

At this moment then, in most animals, take place several ascensional movements of 5 to 10mm Hg, followed by relapse, and then all becomes quiet again after a space of time varying from 40 to 60 minutes (see Fig. 2).

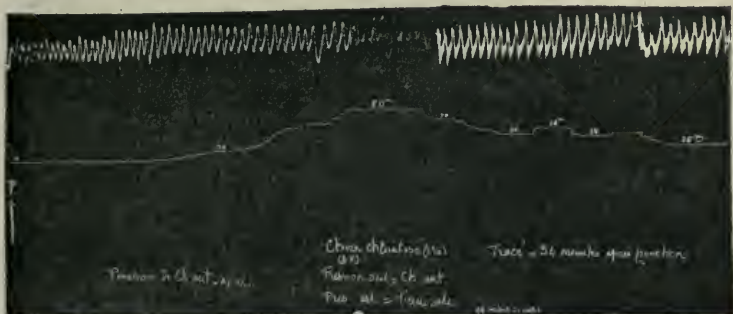


FIG. 2.—Chloralosed Dog. Puncture of the anterior chamber. The lower curve is that of the ocular manometer. After the withdrawal of the aqueous (arrow P) the tension fell to 0. It rose a few minutes after, passed very quickly 20mm, 30mm, and reached in this case 80mm Hg. The descent was nearly as rapid as the ascent. Notice the *oscillations* of the ophthalmotonus before it recovered its original figure 26mm Hg. The upper curve is that of the general blood pressure (crural arteric). Time of the record = 34 minutes after puncture of the anterior chamber.

The first type of experiment, illustrated by the record herewith (Fig. 1), draws attention to the fact, that after puncture of the anterior chamber, not only does the ocular tension rise again to its primitive level, but on the contrary it considerably exceeds it. Moreover it must be noted that it does not return to the original figure until it has gone through a fresh series of rises and falls. On the other hand, the carotid record shows that the variations of the arterial pressure, being inexistent, could not explain these oscillations.

EXPERIMENT TYPE B.—The patient is a young man suffering from atrophy of the optic nerve resulting from an old intracranial injury, but whose eyeball is entirely normal. Two drops of holocaine 2% are instilled. The ocular tension taken on both sides is 20mm Hg (Schiotz). The anterior chamber of one of the eyes is then punctured and emptied almost without aspiration.

The binocular tension is taken every half-hour. At the end of the first 30 minutes the tension has gone up to 20mm. At the end of the first hour it has reached 32mm. After one hour and a half it still remains at this figure. After two hours it has fallen again to 25mm. It remains at this level for a time and then slowly falls and becomes fixed at 20mm, six hours after the puncture of the anterior chamber (Fig. 3).

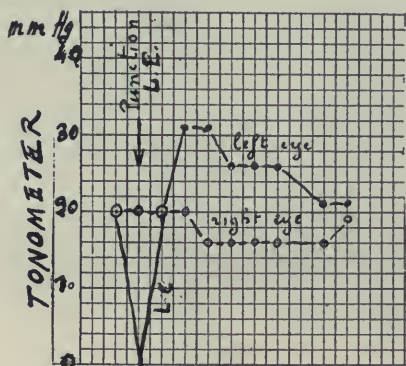


FIG. 3.—Puncture of the anterior chamber on patient aged 21. Ophthalmotonus tested every 30 minutes with Schiotz's tonometer. Comparative record of both eyes.

Variation.—In man as in animals it happens that the original tension is not definitely reached until after one or two rises.

This second type of experiment proves to us that, in man as well as in animals, puncture of the anterior chamber brings about a hypertension, and often a certain instability before reaching again the figure of the other eye which serves as a standard.

The sole difference consists in the fact that the original pressure is more rapidly regained in the dog than in man. We should note also that the oscillations of the ophthalmotonus are ascending not descending; in other words, the tension rises above the starting point several times but does not descend below it any more.

To what may we attribute this phenomenon? We have seen that the modifications of the *general* pressure are not in ques-

tion since in animals the pressure in the carotid remains unchanged. On the other hand there remains the local blood pressure. The following experiment will reply to this.

EXPERIMENT TYPE C.—A dog whose right carotid has been ligatured. The left eye is punctured and in conformity with experiment A, we note a hypertension, oscillations and return to the original figure at the end of one hour.

If the right eye be now punctured, on the side of the ligatured carotid, and the result be observed with the mercury manometer, it is noted that no hypertension takes place. Quite to the contrary the figure given by the ophthalmotonus before puncture is only reached again very slowly and after several hours (Fig. 4).



FIG. 4.—Chloralosed Dog. *Right carotid art. ligatured.* Ocular manometer connected with the left anterior chamber. Ophthalmotonus = 21mm Hg. Puncture and withdrawal of the aqueous humor (arrow P). Ocular tension falls to 0. In the reverse of the records 1 and 2 the ocular tension does not rise quickly, and after 55 minutes it has only reached 16mm.

This experiment shows therefore that the local blood pressure is the primordial factor. But in what manner? Is it by transudation of the endocular liquid, or; is it by simple vascular repletion?

For the discussion of this question we possess already several data:

1. The normal ocular tension in a healthy animal is made up of two factors. One belongs rightfully to the eyeball the other is extraneous. It is also a fact that when an animal is killed by bleeding, the ophthalmotonus does not fall to zero but to 10mm Hg approximately. It is only after 20 hours that the

tension becomes negative. Independently of all circulation the eyeball possesses therefore a positive pressure of 10mm . The surplus is due to local blood pressure. Experiments in perfusion prove this (O. Weiss).

2. The tension of 10mm which seems to belong solely to the eyeball is in reality the pressure under which is stored the aqueous humor. It would seem moreover evident that this pressure of 10mm is itself a consequence of the local blood pressure. In other words, it is the result of the osmotic pressure.

3. After puncture of the anterior chamber the liquid which fills it again, *is not aqueous humor* but an exudation. It is at the end of 4 hours in man, from 16 to 20 hours in animals, that the intraocular liquid is really once more aqueous humor (Mestrezat and Magitot).

Now, if we consider the hypertension which succeeds puncture of the chamber we notice that it reaches its maximum in the dog a quarter of an hour after the puncture, in a young man one hour after the normal liquid has been withdrawn. At first sight this hypertension would therefore seem to be much more related to the transudation of the exudation than to the regeneration of the normal aqueous humor. If we examine the question more closely, this hypothesis is untenable. The second aqueous humor presents its maximum of albumen towards the third hour in animals, and at the end of 45 minutes in man (Mestrezat and Magitot). On the other hand the hypertension is produced in man one hour after, in animals 10 minutes only after puncture.

Lastly, another consideration; when the blood pressure of the eye is diminished by ligature of the carotid on the same side the phenomenon of hypertension does not take place.

The cause of this hypertonia would therefore be the local pressure, but in what manner?

It is quite evident that in emptying the anterior chamber, we determine a fall of the ophthalmotonus; in fact, the manometer which marked 20 to 25mm Hg falls to zero. This depression, even when made slowly, naturally engenders a mechanical dilatation of the capillaries and small arteries whose walls are distended by the blood column which possesses a diastolic pressure of at least 30mm Hg, and a systolic pres-

sure of 70mm. It is due to this modification that the phenomena of dialysis are modified and that the blood serum passes through the cellular membranes. But *the distended vascular walls react and cause a slight constriction*. It is these repeated efforts, alternately successful and unsuccessful, which are expressed by the hypertension and the very curious oscillations which succeed it. If this hypertension is absent after ligation of the carotid, the cause must be attributed to the fact that the suppression of this vascular trunk diminishes the pressure of the local blood column that is proceeding to the eyeball by the roundabout way of the anastomoses.

AFTER MASSAGE.

The phenomenon of hypertension after puncture of the anterior chamber may be brought about by two methods: prolonged massage of the eyeball, or a pressure of from 200 to 250 grammes applied for at least 5 minutes. (With Bailliar's instrument.)

We have made these experiments not only on the usual laboratory animals (Bonneton on the rabbit), but above all on *man*. I have chosen among the ten charts obtained two of the most characteristic, although, in reality, all are very similar.

The technic used is as follows: After instillation of holocaine 2% the tension is taken with Schiotz's tonometer in order to make sure that both eyes are the same. A pressure of 250 grammes is then applied with Bailliar's pressure gauge directly on the external side of the sclerotic of one of the eyeballs. This pressure must be continuous and there must be no slipping. Experience has shown me that in spite of this pressure of 250 grammes pain was very slight and the oculo-cardiac reflex extremely silent. For further security a drop of holocaine is let fall from time to time between the eyelids of both sides.

When the pressure gauge is removed, it will be noted that the eye is soft; the anterior chamber slightly diminished in volume and the iris in miosis. Parallely, every 5 minutes, the ocular tension is rapidly taken on both sides. The results are as follows:

The tension on the eye to which pressure has been applied, rises rapidly. In 5 minutes, sometimes 6 or 7 minutes, it

reaches once more the original figure. In 10 or 12 minutes it rises above it and according to the subject reaches 40 or 50mm.

During the following hours, the ophthalmotonus goes down, and, after oscillations even more marked than after the puncture of the anterior chamber, it reaches again the tension of the other eye, whose variations during this time have been insignificant. This state of calm is only reached at the end of 4 or 6 hours (Figs. 5 and 6).

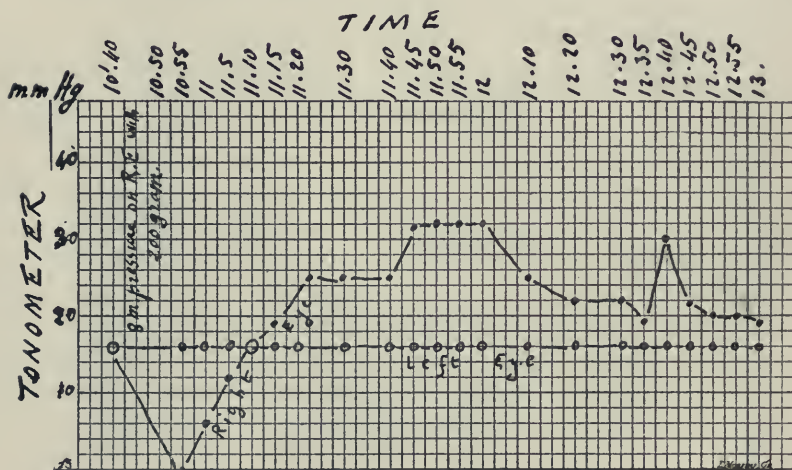


FIG. 5.—Patient age 28. On R. E. pressure during 8 minutes with 200 grammes. Comparative tonometric record of both eyes from 10.40 A.M. to 1 P.M.

This example shows that continuous pressure on the eyeball engenders the same reactional phenomenon as puncture. The explanation of the fall of the ophthalmotonus to zero deserves consideration. Firstly, the negative tension is only obtained by considerable pressure. Moreover the application of this pressure must be sufficiently prolonged. It is easy to conceive that this maneuver drives the blood out of the eyeball. But we know that the disappearance of the blood column still leaves in the eyeball a tension of about 10mm Hg. And, after application of pressure, this disappears.

This negative tension of the eyeball indicates plainly to us that the pressure under which is stored up the aqueous humor

has vanished. Partisans of the angle of discharge will have it that the liquid (the anterior chamber is not effaced) is simply due to its passage through the vascular membranes the porosity of which is modified by the traumatism.

I would moreover compare this phenomenon with ophthalmomalacia, this affection, always traumatic, which is due to a

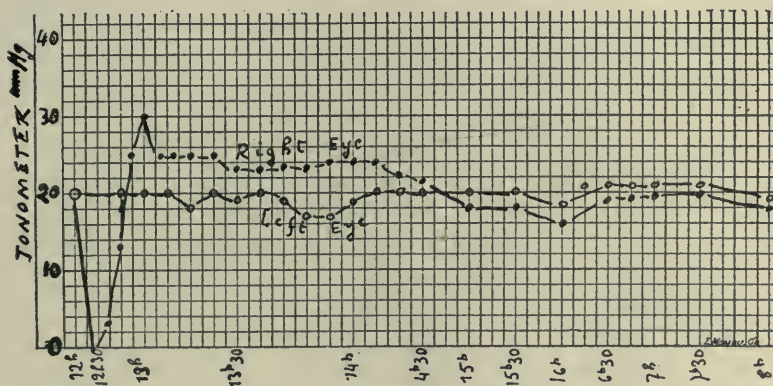


FIG. 6.—Woman age 40. On R.E. 5 minutes pressure with weight 200 grammes. Comparative tonometric record of both eyes from 12 to 6 P.M.

shock on the eyeball. The negative tension persists for a time, more or less long, sometimes for weeks.

I have besides shown, in 1919, that the ocular tension of traumatised eyes presented for a long time oscillations which in a longer period appear to be the exact copy of those I have just described, and which manifest themselves during the hours which succeed puncture of the anterior chamber or a considerable pressure on the eyeball (Magitot).

OCULAR HYPERTENSION BY EXPERIMENTAL IRRITATION OF THE IRIS

The direct intervention of the iris in the modifications of the ocular tension has been considered as possible several times, but no proof of it has ever been given. The experimentation is in fact delicate and necessitates a fairly long apprenticeship, so that authors desirous of showing its rôle have

usually made use of arguments drawn from clinical facts rather than of data supplied exclusively by experiments. However, those who proceeded to researches, by means of manometers, on the ocular tension have in general not been long in observing disconcerting phenomena when the needle introduced into the anterior chamber deviated in certain positions. It is thus that Morax, in the course of his experiments with Girard, remarked that if the point of the small canula needle entered into contact with the iris of a rabbit, the manometrical results of the experiment were absolutely false and he was obliged to have recourse to a fresh animal.

It is a long time ago since I had observed these effects which manifest themselves with much greater amplitude in the cat than in the rabbit and when with Bailliar^t we were making our researches with pressures exerted on the eyeball, he also was, on several occasions, a witness to this phenomenon.

Since then, I had several times endeavored to provoke it in order to register it on a chart, but it is only recently that I have been able to attain my object.

The following record shows the phenomenon better than any description could do. Registration was obtained by means

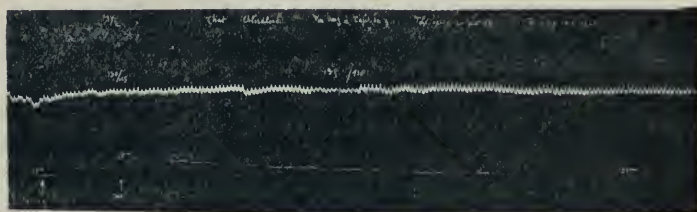


FIG. 7.—Chloralosed Cat. Manometric record of the hypertension by irritation of the iris (lower curve). This hypertension is entirely independent of the general pressure as it appears on the upper curve. Total time=33 minutes.

of a drum turning slowly, a complete revolution of which takes place in 35 minutes. The subject was a cat anæsthetized by intra-peritoneal chloralose.¹ The upper undulating line is the

¹ Chloralose (and not chloral hydrate) is preferred to other hypnotics, its action on the blood pressure being very slight.

record of the arterial pressure taken at the lower part of the abdominal aorta. The lower line gives the ocular tension taken with a mercury manometer (Fig. 7).

The starting tension was 30mm Hg. a somewhat high figure, which, indeed, had drawn my attention to the sensitiveness of the animal and given me the idea of registering the hypertension by irritation. The two arrows indicate the moment when the point of the needle introduced into the anterior chamber was placed in contact with the iris. The ascension of the tension takes place rapidly. In 3 minutes it reached 42mm. In 7 minutes 56mm. The needle was then removed and the eye left to itself.

Little by little the tension fell and, as can be seen on the chart, it came back to 30mm the starting figure. In order to reach this original figure twenty minutes were necessary.

During the whole experiment the blood pressure varied only in insignificant proportions. The hooks registered at the start before the irritation are but the results of a slight agitation of the animal due to the medullary hyper-excitability provoked by the chloralose. But it may be noted that from the moment when the ocular tension began to rise, the aortic pressure no longer varied.

And now what may we conclude from this experiment? It is hardly possible to discuss doctrines. I will confine myself to indicating that the rapidity with which the phenomenon manifests itself is far more in favor of a local hyperæmia than of an increase in secretion of aqueous humor.

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ISOLATED PARALYSIS OF THE INFERIOR OBLIQUE.

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ALTHOUGH a number of cases of isolated paralysis of the inferior oblique have been reported, the infrequency of its occurrence seems to justify the placing upon record of some additional cases, with some references to the literature.

The cases reported by Mauthner (1), Bielschowsky (2), A. Graefe (3), Knabe (4), Fuchs (5), Sachs (6), Gullstrand (7), Terson (8), Delneuve (9), Cohen (10), Cuignet (11), (12), Noyes (13), de Lapersonne (25) and Mooren (14) are referred to by Steindorff (20) in a paper published in 1913 describing also an additional case, an undoubted one following sinus infection.

Mauthner's case was the result of the unintentional cutting of this muscle in the course of an operative procedure upon the face. The case is presented with data corroborating the diagnosis.

Bielschowsky has seen four cases and shows photographs which in addition to other data make the diagnosis clear. Of these one is traumatic in origin, one in all probability due to a gumma of the orbit and in the third there was a syphilitic infection of the central nervous system. Although the ætiology of the 4th case is doubtful a toxic arthritis was present.

A. Graefe describes three cases: one due to a blow in the infraorbital region, one to syphilis, and the third occurred in a 95-year-old man, afflicted with arthritis.

The report of Knabe deals with a case, due to trauma, seen and separately reported also by A. Graefe.

Fuchs and Sachs have separately reported another case due to trauma. The description of this case leaves no doubt as to its genuineness.

Gullstrand describes two cases, one due to trauma, the other apparently congenital, associated with a scrofulous keratitis. Photographs show the characteristic deviation very clearly.

Terson's case followed an injury to the inferior margin of the left orbit. A child, 13 years old while playing was struck in the face and a few minutes later complained of a diplopia, a convergent squint was found to have developed, the left eye lagging upon looking up. Study of the diplopia showed it to be homonymous, the image of the left eye being higher than that of the R. This case may be accepted as authentic.

The photograph shown by Cohen in reporting his case makes the diagnosis certain. It was of congenital origin and possibly associated with paralysis of the superior rectus on the same side.

Cuignet's cases cannot be included in this series. Although they are described at length, they are not clear.

It is obvious from Noyes's own description of his case that the superior rectus was the muscle involved and not the inferior oblique. His diagnosis seems to have depended upon the site of the injury rather than the character of the diplopia.

Mooren's six cases must be rejected for want of sufficient data upon which to judge them.

The case described by de Lapersonne must be accepted. The nature of the paralysis is clearly apparent from his description. It followed a fall from a bicycle which produced a contusion of the left side of the face and hemorrhage into the left maxillary sinus. De Lapersonne attributed it to fracture of the floor of the orbit although both the lacrymal sac and infraorbital nerve were intact.

Delneuve's case is quite similar to de Lapersonne's. The diplopia he describes is characteristic. It followed a fall and was associated with an infection at the lower margin of the orbit.

In addition to these references of Steindorff, cases have been reported by the following: C. S. Bull (15), Little (16), Hulke (17), Dalwig (18), Hertel (19), Inouye (21), Page (22), Ulbrich (23), and V. Stellwag (24).

Bull states that a careful study was made of his case but gives no data in support of his diagnosis.

The same may be said of the cases of Little, Hulke, and Dalwig.

Hertel's description of his case leaves no doubt as to the diagnosis. It followed a fall and was associated with paralysis of the left arm and left leg.

Inouye's case is a genuine one, although his description is somewhat complicated. It resembles Steindorff's in that it followed infection of the sinuses.

From Fage's description of his case it would appear to be one of paralysis of the superior rectus. He seems to have based his diagnosis upon the location of a blow in the inferior orbital region.

Ulbrich's case may be genuine but there are no data upon which to judge it.

Stellwag Von Carion's description of his case is supported by a diagram of the characteristic diplopia. It came on suddenly following cauterization for trachoma.

The following three cases were seen in the clinic of the Herman Knapp Memorial Eye Hospital.

CASE 1.—Paralysis Right Inferior Oblique with Paresis Right Superior Rectus (Traumatic).

Rose F., age 25, came to the clinic June 14, 1920, complaining that her eyes "jumped." About three weeks before while on the way home from work her right eye was accidentally struck by a baseball. When able to open her eye several days later, no diplopia was noted. Upon examination: Vision: R. = $\frac{20}{60}$; L. = $\frac{20}{40}$. Tension normal. L. showed no changes. Anterior chamber of the R. seemed somewhat deeper than L., iris not tremulous. The pupil was dilated (she had been using drops) oval, its margins indented and bound down by some posterior synechia. The lens was clear. There were vitreous opacities blurring the fundus, examination of which revealed a rupture of the choroid extending into the macula.

The motility of the eyes was unimpaired except in the following respects: In looking up and to the right the R. lagged indicating paresis of the R. superior rectus. In looking up and to the L. the R. did not go up at all, indicating complete paralysis of the R. inferior oblique. There was a slight ptosis of the R. upper lid. Diplopia was easily elicited with a red glass in front of one eye. This demonstrated a L. hyperphoria which increased when the patient looked up and to the right, and increased very much more on looking up and to the left.

There was no evidence of fracture of the inferior orbital margin. Immediately after the injury she was unconscious

for a short time, subsequently her lids became swollen and ecchymotic, her eye painful. The remaining ptosis and paresis of the superior rectus may be explained by hemorrhage. The paralysis of the inferior oblique may be explained in this way, but it also seems possible that a blow of sufficient force to knock the patient unconscious, and so directed as to produce a rupture of the choroid might also rupture structures, the function of which is in part to maintain the antero-posterior position of the eye in the orbit.

When last seen 5 months later there was no change except for a developing head-tilt.

CASE 2.—*Paralysis Right Inferior Oblique (Congenital).*

For the opportunity of seeing and reporting this case I am indebted to Dr. J. W. White, in whose private practice it occurred. Claire G., age 7, first seen Nov. 13, 1920. At the age of about 18 months, the mother noted that the L. eye of the child "cocked up." She paid no attention to it thinking that the child was playing. Later it was noticed that the left eye was higher, especially when the child was tired or had been scolded. There was no complaint of diplopia at any time. The child had a normal birth, and has always been well. There are two other healthy children.

Upon examination: Vision: R. = $\bar{c} + 1.50 S + 0.75 C 90^\circ \frac{3}{8}$; L. = $\bar{c} + 1.50 S + 0.75 C 90^\circ \frac{3}{8}$. Both eyes normal. Motility normal except that upon looking up and to the left the R. failed to go up at all.

At 6 M. Exo. = 4Δ ; L. Hyp. = 4Δ in the primary position. In eyes up and L. there was a L. Hyp. of 10Δ p. p. c. $9.5cm$. It was noted that the patient could roll her left eye up almost at will. No diplopia could be produced with a red glass. When looking straight ahead the eyes seemed to be perfectly straight. Torsion not looked for.

This case is obviously of congenital origin. The child has been under observation from time to time and seems to be getting on well with glasses correcting her hypermetropia and astigmatism. She has no head-tilt.

CASE 3.—*Probable Paralysis Left Inferior Oblique (Traumatic).*

Gustava K., age 51, came to the clinic Jan. 31, 1921, and was first seen by Dr. J. W. White. About two weeks before coming to the clinic she was struck on the bridge of her nose by some heavy object. A homonymous diplopia with a varying vertical deviation developed which upon first examination was tentatively diagnosed as paresis

of the R. superior oblique. At this time a R. hyperphoria increasing down and to the left was found. Nine days later by the screen and the parallax test a R. hyperphoria increasing up and to the left was found. A third examination eight days later, or 17 days after her first visit (tested with candle, the right eye being covered with a red glass) she showed a vertical diplopia in the right upper quadrant of her field, the red image being lower and to the left of the white, confirming the diagnosis of paresis of the L. inferior oblique. There was no diplopia in other parts of the field. No note was made as to the tilting of the image. Vision: R. = $\frac{2}{8}$ corrected to $\frac{2}{8}$; L. = $\frac{3}{8}$ corrected to $\frac{2}{8}$; J 1 + 2.00 added to her distance glass. There was orthophoria for distance, an exophoria of 4Δ at $\frac{1}{3}$ M., p. p. c. 9cm. from base line. Torsion not looked for.

This case is obviously one of paresis of the inferior oblique and was transitory in nature.

Among the records of my father, Dr. F. W. Marlow I have found the following cases:

CASE 4.—*Probable Paralysis Left Inferior Oblique.*

Mrs. G. D. W., age 40, presented herself for examination on February 22, 1892, complaining of pain and aching behind her eyes after reading. Examination showed no disease. Vision $\frac{5}{8}$ each with refractive correction. R. hyp. less than 1° , Eso.—2 degrees. Fifteen years after this her refraction had changed; R. hyp. increased to 2 degrees. She was re-examined on several occasions up to April 23, 1917, 25 years after her first visit, and each time the R. hyp. had increased in amount. On April 23, 1917, the R. hyp. was more than 6° in the primary position. Examination in different positions showed the R. hyperphoria to be greatest on looking up and to the right, least down and to the left. She was given prisms correcting her hyperphoria and obtained relief. No torsion noted.

No explanation is offered as to the cause in this case. There was no intercurrent infection or local disease present.

CASE 5.—*Paralysis Left Inferior Oblique.*

Miss M. F. C., age 17, came for examination on December 10, 1892, with the following story. Seven weeks before the left eye and side of her face became swollen. There was headache radiating from forehead to occipital region, and some nausea. The acute symptoms subsided two days later but the headache persisted. Reading made

this worse and she was apt to wake up in the morning with headache.

Examination showed: Vision: R. $\frac{5}{8}$ corrected to $\frac{5}{8}$ R. hyp. $\frac{1}{2}^{\circ} +$; L. $\frac{5}{8}$ corrected to $\frac{5}{8}$. Exo. $2^{\circ}-3^{\circ}$. There is nothing noteworthy in her subsequent history up to Jan. 2, 1920.

At this time her vision was $\frac{5}{8} +$ with proper glasses. There was now L. hyp. 1° , exo. 2° , pres. $+ 1.50$ D. Fundi normal.

April 11, 1921, she returned complaining as follows: About three weeks after her last visit the year before, she began to notice blind spots before her eyes, the L. more than the R., which produced blank spots on a printed page when she read. In the intervals between the appearance of these blank spots her vision remained good, but for the past six weeks this defect had become constant. She has had a diplopia since last summer.

Upon examination: Vision: R. = $\frac{6}{4}$ c her glasses -0.50 s added $\frac{6}{8}$; L. = $\frac{6}{4}$ her glasses unimproved. R. hyp. 9° in the primary position, greatest up and to the right. Ophthalmoscopic examination revealed a group of spots, between the disk and macula in the L. eye. The R. pupil measured 2mm and reacted well to light; the L. pupil 3.5mm reacted to light slightly. Tension both eyes normal. The L. eye looked too prominent, measurements with the exophthalmometer were R. 15mm or less; the left 15mm or more. Fields normal. No scotomata.

Three months later, July 29, 1921, vision each eye was reduced to $\frac{5}{8}$. There was then some mental deterioration. The R. hyperphoria had increased to 13° . No torsion.

Her general condition varied from time to time, the mental deterioration gradually increasing. She later developed a R. hemiplegia and died on Jan. 13, 1922. No autopsy was obtainable. It is probable that she had a brain tumor although no diagnosis could be definitely made.

CASE 6.—*Paralysis Right Inferior Oblique (Congenital).*

Mr. W. G. C., No. 40—26, seen Nov. 4, 1897, because of nearsightedness. Refraction under scopolamine: R. -4.00 s.; L. -2.25 s. $\bar{c} - 0.25$ c 180° . Exophoria 1° . L. hyperphoria 2° (cover test). He returned from time to time for re-examination and it is to be noted that more and more hyperphoria became manifest.

July	6, 1899—	L. hyp.	$2\frac{1}{2}^{\circ}-3^{\circ}$
Feb.	3, 1903—	"	$4^{\circ} +$
Nov.	3, 1903—	"	5°
March	30, 1907—	"	4°

Nov.	12, 1908—	L. hyp.	6°
May	15, 1919—	"	8°—10°
May	29, 1919—	"	9° rod, 4° parallax
May	4, 1922—	"	8°

Examination on this latter date yielded the following data:

With binocular fixation there was no limitation in motility except in looking up and to the left when the R. failed to go up normally. With the R. fixing when looking in this direction there was a definite limitation in the excursion of the R. eye and a corresponding excessive excursion of the L. With the L. fixing the R. scarcely moved above the horizontal meridian whereas the movement of the L. was normal.

The screen test demonstrated the following:

Eyes up	and to the R.	— Exo. 4°;	L. hyp. low or 0
" "	" " " L.	— " 6°;	" 10° —
" down	" " " R.	— " 6°;	" low or 0
" "	" " " L.	— " 6°;	" " " "

Diplopia was easily produced with a red glass, there being a characteristic L. hyperphoria which increased rapidly on looking up and to the left. There was binocular single vision on looking down and to the left and right. There was a low left hyperphoria up and to the R. No torsion.

This patient had no head tilt.

This case is undoubtedly of congenital origin and it is particularly interesting to note the manifestation of an increasing amount of hyperphoria over a period of twenty-two years. No explanation is offered for this.

In an unpublished paper, read in Montreal some years ago, Dr. Alexander Duane described five cases. I am indebted to his courtesy for permission to include these.

CASE 7.—Congenital Paralysis of Right Inferior Oblique Apparent Ptosis (Spastic Closure of Lids) in Abduction.

"Elsie M., aged 26, a patient of Dr. C. W. Cutler's to whom I (Dr. Duane) am indebted for the privilege of seeing her. Drooping of lid noticed since birth. She says that this has always been more marked in looking to the right and less marked when looking to the left. Also says that she always sees double when trying to look up.

"Width of right palpebral fissure 8 to 9mm when she looks straight ahead, 5 to 6mm when she looks to the right, 13 to 14mm when she looks to the left. The enlargement in looking to the left occurs both in convergent and in parallel

movements. No change in width of fissure produced by movements of the jaw. Width of left fissure 13mm not changing in right or left movements of the eye. Pupils equal and reactions normal; no alteration in size produced by looking to the right or left.

"For distance exophoria 5° — 7° with binocular fixation; no hyperphoria. For near sometimes binocular fixation down 3 or 4 inches (with exophoria of 12° or more), sometimes alternating divergent squint. Movements of left eye free in all directions. Movements of right eye up and to the right normal, up and to the left much restricted (both in binocular vision and when left eye is covered.) Otherwise movements normal. With fixation-object at three feet vertical (left) diplopia (i.e., diplopia with the image of the left eye below) increasing fast as she looks up and to the left (to 6 or 12 inches); much less when she looks straight up. When she looks up and to the right, little vertical marked and increasing crossed diplopia. No retraction movements of eyes. No torsion of Maddox-rod clinometer in right eye even when eye is directed upward.

"Repeated tests always give the same results. Interior normal. Vision $\frac{2}{8}$ each."

CASE 8.—*Paresis Right Inferior Oblique.*

"Charles R. H., age 24, left hyperphoria 1° increasing after the use of prisms to 3° . With test-object at three feet, single vision everywhere in lower field, crossed diplopia in upper field.

"When he looks up and to the right no vertical diplopia; when he looks up and to the left increasing vertical (left) diplopia (corrected by a 7° prism). Linear separation of double images 2 or 3 inches. Although the diplopia is thus but slight in amount it is present over nearly the whole upper field. Cf. case 8. Extorsion of right eye by Maddox-rod clinometer at times 0° , at times 2° to 5° .

"Prisms correcting 2° of left hyperphoria relieved his persistent headaches, and combined with glasses correcting a slight hyperopic astigmatism, were worn with comfort."

CASE 9.—*Probable Paralysis of Right Inferior Oblique (Traumatic) With Spasm (Contracture) of Right Superior Oblique.*

"Theresa J., aged 49. At age of 12 fell down a hatch on shipboard and injured her eye. Ship's doctor removed a splinter of wood from the eye or thereabouts. Vision poor in right eye ever since.

"Right divergent squint with marked amblyopia (V. = about $\frac{2}{80}$). Movement of eye inward deficient by 2—3mm.

Movement of eye up and out fair, and straight up pretty good. When she looks up and to the left, right eye moves in part of the way then drops rather sharply to the horizontal plane. Movement of right downward normal or excessive. When she looks down and to the left, right eye shoots below level of left and then diverges so as to stand in middle line and point far down.

"No scar or other evidences of injury. Right interior normal, even in extreme periphery of fundus."

CASE 10.—*Paresis Right Inferior Oblique.*

"Mrs. C. LeB., age 43. Headaches and vertigo but never spontaneous diplopia. Repeated tests at different times during two years show consistently the following:

"(a) Left hyperphoria of less than 1° when eyes are directed at distance;

"(b) Limitation of movement of right eye up and to the left;

"(c) With test-object at three feet vertical (left) diplopia occupying a part or the whole of the left upper quadrant and sometimes encroaching far beyond this into the right upper and left lower quadrants. Diplopia only slight in amount (double images never more than 4 inches apart and never requiring more than 10° prism to unite them), but is insuperable and always covers a relatively large area of the field. It varies considerably from time to time and even during the course of a single examination as if the muscle got tired and allowed the eye to sag.

"(d) Sometimes there is no lateral diplopia in upper field, sometimes a slight homonymous diplopia. The tendency to homonymous diplopia is less in looking up than in looking down. No cause can be assigned for the paresis.

"(e) Right eye with Maddox-rod clinometer or with candle shows either no torsion or an extorsion. (!)"

To these cases may be added one which Dr. Duane is able to report through the kindness of Dr. C. E. Finlay of Havana, in whose practice it occurred.

CASE 11.—*Paralysis of Right Inferior Oblique.*

"Lady, 28 years of age, unmarried, suffering from displacement of the kidney with frequent attacks of biliary colic. Is taking and has taken much morphine. Diphtheria two years before. Headaches on reading.

"In the primary position sometimes diplopia, sometimes single vision. In upper field typical diplopia, *i.e.*, in looking up and to the left marked vertical (left) diplopia with slight

homonymous diplopia. In looking up and to the right slight vertical and increasing homonymous diplopia with marked right-angled tilting of right eye image. Line of separation between fields of single and of double vision runs obliquely down and to the left.

"Under rest and tonics improved rapidly and diplopia disappeared. Trouble subsequently recurred as a result of using the eyes too much for near work. Under same treatment perfect recovery."

The ætiology of isolated paralysis of the inferior oblique muscle as reported by various observers, including the cases added here, may be summarized as follows:

Trauma in 13 cases.

Congenital origin in all probability in 5 cases.

Syphilis in 2 cases.

In 6 cases the ætiology is uncertain.

In a personal communication Dr. Duane tells me that he has seen 3 cases of well-marked paralysis and one of paresis in addition to those quoted. Only one of these was due to trauma. Tenotomy of this muscle, as described by Duane, must not be forgotten as a cause of this condition.

While trauma appears to be the most frequent ætiological factor, the fact that more than half the cases here cited have some other ætiology, makes it evident that there are many exceptions to this rule. It is this belief, no doubt, which misled Noyes for example, in spite of the fact that the complete description he gives, makes it clear that the superior rectus was the muscle paralyzed. The same may be said of Fage's case.

Implication of the inferior oblique in partial paralysis of the 3rd nerve is fairly common. It may be the first muscle to become affected and also the last to recover. The following case illustrates this latter possibility and shows how with no previous *knowledge* of the history the true ætiology may be so obscured that a diagnosis of isolated paralysis of the inferior oblique would be made.

Mr. Geo. P., first seen by Dr. F. W. Marlow, Jan. 8, 1892. He came with asthenopic symptoms and was given glasses correcting his myopia and astigmatism. He had no muscle imbalance at this time but on subsequent examinations a R. hyperphoria of 2° to 5° developed. On June 6, 1919, he

presented himself for examination with the following story: Six months ago, Jan. 2, 1919, he woke with "paralysis of his L. eye," which had closed by night. He was in Minnesota when this occurred and saw an ophthalmologist there. Fourteen years ago he had a luetic infection for which he received treatment. A Wassermann test made 10 years ago was negative. Since the onset of his present trouble, however, he has had eight salvarsan injections, his Wassermann on June 4th, 2 days before examination being negative. Although his left upper lid has been normal for the past month, a diplopia in the upper part of his field has persisted.

Examination showed: Vision $\frac{8}{8}$ each eye, refraction corrected. The R. pupil was small reacting to light and accommodation. The L. pupil larger than the R. reacted to accommodation but its reaction to light was defective. With the Maddox-rod he had a R. hyperphoria greatest up and to the R. In the primary position with the light 6 M. distant it measured 30° . He was given a 5° prism base down over the R. eye, a 6° prism base up over the L. for temporary wear. This gave him relief and increased greatly his field of single vision. Later the prisms were changed to R. 7° down, L. 6° up with which he had no diplopia with a red glass over one eye except when he looked up and to the right.

Associated with paralysis of this muscle paresis of the superior rectus has been noted in the same eye in a few instances. Cohen's case, Case (1) of this series and some others are instances of this sort. It brings up the question as to how frequently this happens and makes it advisable to look carefully for some underaction at any rate of the superior rectus on the same side.

Head tilting has not been a marked feature in any of these cases, nor has it been mentioned in the literature. In the cases reported here head tilting has been noted in one case only, in which the vision of the paralyzed eye was defective.

Torsion cannot be said to be an important feature in this condition. It was present in two of Dr. Duane's cases, absent in two; not recorded in one. In my father's cases no torsion is recorded. It may be assumed to have been absent for the hyperphoria has been tested by means of the Maddox-rod in every case and if present would probably have been noted. In the three cases seen at the Herman Knapp Memorial Eye Hospital it was not looked for. Furthermore, Dr. Duane tells

me that the absence or low degree of torsion is particularly noteworthy in those cases in which this muscle has been tenotomized.

The treatment depends naturally upon the degree of annoyance from which the patient suffers. In some cases no treatment other than the incidental correction of whatever ametropia may be present is necessary. Apparently, they get on very comfortably, no doubt due to the fact that this muscle is fundamentally an elevator and consequently is not called upon to function as frequently as is a depressor. This can be readily understood when it is realized that there is no vertical deviation necessarily manifest in the primary position and if present may be of low degree. Prisms correcting all or part of the manifest hyperphoria present in the primary position afford satisfactory relief in many cases.

Operative treatment is recommended by Fuchs and Sachs who tenotomized the contra lateral superior rectus muscle with a good result in their case. This appears to be a logical procedure for if the inferior oblique muscle can be tenotomized with benefit in cases of paralysis of the superior rectus, tenotomy of the contra lateral superior rectus ought to be a favorable procedure in paralysis of the inferior oblique. Furthermore, it seems reasonable that those cases of hyperphoria which have been benefited by tenotomy of the superior rectus may have been cases of paralysis or insufficiency of the contra lateral inferior oblique and passed unrecognized as such.

It is unfortunate that some of the cases reported in the literature lack the necessary data upon which a correct diagnosis can be made. The diagnosis has undoubtedly been correct, but the proof is not furnished.

The diagnosis must be based upon the characteristic changes.

(1) In the vertical deviations as found by the excursion test.

(2) In the degree of the hyperphoria in looking up and to the R. or L. as measured by the cover test or Maddox-rod.

(3) In the vertical (not the lateral or torsional) diplopia. The frequent absence of torsional diplopia is noteworthy and therefore does not constitute an essential finding in making the diagnosis.

Too much emphasis cannot be placed upon the importance

of determining the action of the extraocular muscles in the six cardinal directions of the gaze.

In conclusion I wish to acknowledge my indebtedness to Drs. Duane and White for the invaluable help they have given me, and to Dr. Knapp for permission to report those cases seen at The Herman Knapp Memorial Eye Hospital.

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FACTORS INFLUENCING THE CHOICE OF METHOD FOR CATARACT EXTRACTION.¹

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IN discussing Dr. Parker's valuable paper on senile cataract extraction at the A. M. A. last year, Dr. Verhoeff called attention to the common failure of cataract statistics to distinguish between types of cataract, and to the lack of attempt to determine the types best suited to the intracapsular methods; and Dr. Parker wisely remarked that the "character of the cataract should determine the method of extraction rather than our enthusiasm for any one method of procedure." No single method of senile cataract extraction is entirely satisfactory as a routine for all cases. Capsulotomy extraction, for example, while the only practical method for young patients, leaves much to be desired in the treatment of immature or of thin hypermature cataracts. Some lenses are easily extracted with forceps by Verhoeff's or Knapp's method, while in others the zonule is too strong or the capsule tears, and we proceed as we can, not as we wish. The Smith method gives ideal results under some conditions, while under others its dangers are so great as to be practically prohibitive; and the method which Prof. Barraquer has so admirably demonstrated will doubtless show its limitations in less skillful hands. For such reasons there is a growing belief that routine use of any method to the exclusion of others is not good surgery, and should give way to selection of the method which best suits the conditions of each individual case and the conditions of the operator. This implies surgical judgment and a much better

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study of our cases, and will be simpler when the indications and contraindications of the various methods have been more carefully worked out. For this latter purpose a study of the conditions under which each type of operation has shown its best and its worst end results, and an analysis of the factors which determined those results, give more information than routine statistics. This paper records the writer's tentative conclusions from such a study, both in his own cases and in the records of many workers to whom his acknowledgments are due; especially to Colonel Henry Smith, to whom his debt of obligation is great. An experience of nine years with intracapsular extraction by pressure, including two periods of training with Colonel Smith in India, has convinced the writer that extraction in the capsule is the theoretical ideal which the future will show to be more or less generally attainable in some form; but that with the possible exception of phacærisis, with which the writer has had no experience, the present field of both the Smith operation and of other intracapsular methods for which the pioneer work of Colonel Smith has prepared the way is limited both by the suitability of cases and by the experience of the operator. The future, however, will hold us in small regard if we do not overcome the limitations of experience, so as to be able to give each suitable patient the benefit of whatever form of operation will give him the best result.

Omitting all reference to iridectomy, preliminary or combined, the methods considered typical for the purpose of this paper are extraction after capsulotomy (either by the linear method or by the Von Graefe flap operation), and extraction in the capsule, either by pressure only as practiced by Colonel Smith, or by traction. The traction methods comprise traction with forceps as recommended by Verhoeff and Greenwood, traction with a vacuum instrument such as Prof. Barraquer has perfected, and combined traction and pressure as advocated by Arnold Knapp and Torck. As a basis of comparison between methods it is assumed that that eye does best which has the fewest necessary manipulations and the smallest amount of trauma at operation, and receives the least irritation thereafter. While intracapsular methods on the whole require fewer manipulations, they may involve more trauma

than capsulotomy methods. So far as this is counterbalanced by freedom from further irritation caused by soft lens matter and capsule, they are preferable; and this balance largely determines our choice between extraction with the capsule or without it.

The conditions or factors which influence the choice of method may differ in relative importance in each case. They are here considered in three groups, the first including the age of the patient, the type and stage of maturity of the cataract, and the presence of complications; the second having to do with such conditions as the probable behavior of the patient, the prominence or recession of the eyeball, and the size of the cornea; the third group dealing with conditions affecting the operator, including his skill and training, the frequency with which he operates, and the quality of his assistance.

The age of the patient and the type of the cataract are the first factors considered in determining the type of operation which is most suitable. In children, Colonel Smith distinguishes three clinical types of cataract: the membranous, which he extracts with forceps; the milky, which he needles; and the jelly-like flocculent cataract for which he employs linear extraction. In this country cataracts of any type in children young enough to have no nucleus (i.e. up to about 15 or 16), are generally needled, though the suction method is sometimes used for the softer ones. Beyond 18, linear extraction may be safer. The cases suitable for linear extraction were well summarized by Dr. Wilder in 1916, as all soft cataracts in which a nucleus has not yet formed or it is so small that it will readily escape through a 10mm linear incision, including lamellar cataracts, juvenile cortical and capsulo-lenticular cataracts, and all forms of soft or fluid complete cataracts, whether spontaneous or traumatic, up to the age of 30 to 35 years; also lenses in high myopia. As the patient approaches 40 and the nucleus becomes presumably too large for the linear incision, the Von Graefe operation becomes the operation of choice. This holds also for traumatic cataracts, unless the lens is dislocated without rupture of the capsule, when some form of intracapsular extraction is advisable.

Senile cataracts require more detailed consideration. In a general way, the younger the patient the smaller the nucleus,

and the stronger the attachments of the lens, both zonular and hyaloid. In nearly all patients under 40, in most patients under 55, and for the novice in intracapsular methods and especially the Smith method, in patients under 60, zonular rupture is apt to be too difficult, and extraction with capsulotomy is generally the wise choice. Conversely, the older the patient, the easier is the dislocation of the lens likely to be, and therefore the safer for intracapsular extraction if the lens is not too large. Barraquer considers his method suitable for all senile, but not for juvenile and congenital cataracts. In the 200 cases reported by Arnold Knapp as extracted by his method only 15 were under 55; and 1 under 40. Colonel Smith says that "Cataract in children and juveniles is not suitable for extraction in the capsule as they are exceedingly difficult to dislocate." Verhoeff pays more attention to type, and advises some method of intracapsular extraction for immature and hypermature senile cataracts, but advises against intracapsular extraction with forceps for mature cataracts and sclerosed lenses on account of the fragility of the capsule.

Four more or less regular stages and two variations from type are sufficiently distinguishable in senile cataract to be considered in relation to the type of operation best suited to them. These are Immature, Swollen, Mature, Small hypermature, Thin hypermature, and Sclerosed lenses. Immature cataracts, in which the edge of the iris still casts a shadow, usually have an anterior chamber normal in depth, and a lens fairly normal in size, shape, and consistency. The transparent cortex adheres to the capsule and it is impossible to see it so as to get it all out. Because the eye does not do as well if it is not gotten out, capsulotomy operations are not very satisfactory, and many men therefore postpone such operations as long as possible; these cases are well suited however to intracapsular extraction as the capsule is usually reasonably strong. If the patient is old enough to make zonular rupture by pressure easy, the Indian operation goes very well; the zonule ruptures above in the early stages, below in the cases which are near the swollen stage. Where zonular rupture by pressure is not easy, rupture by traction is advisable, either with forceps if the capsule is not too tense to wrinkle and can be grasped by them, or by the vacuum method of Barraquer: but the capsule is

more likely to be torn in these cases which are difficult to dislocate by pressure from the outside.

The next stage is the swollen or intumescent cataract which has just become mature, and is pearly white and flocculent. Here the anterior chamber is shallow, the lens larger and rounder than normal, and the capsule is thinned and tense, too weak to allow any form of intracapsular extraction by traction, which is therefore contraindicated. These are easy cases for extraction with capsulotomy, or for intracapsular extraction by pressure. They are the easiest and the safest cases on which the beginner may try the Indian method. Quick pressure with the point of the hook at the lower margin of the cornea ruptures the zonule below, and they tumble out bottom first with gentle follow up pressure. In this type many of us have had cases where the patient has expelled the lens in its capsule involuntarily, sometimes with loss of vitreous, and have been surprised at how well they have done. These lenses, though large, often mold easily, so that the exact size of the wound is less important. The capsule, however, is apt to be very fragile, and may rupture if pressure is increased too rapidly before the largest diameter of the lens has passed the wound, or if the capsule is touched with the point of the hook, or if the wound is too small. For this reason the final removal of the lens from the wound is best performed with the curve of the hook. If the capsule ruptures and hangs partly out of the wound, Colonel Smith's method of grasping it with anatomical dissecting forceps with long approximating surfaces, held parallel to the wound, is very efficacious, if a conjunctival flap is not in the way. If the burst capsule is entirely inside the eye, which should rarely happen, Smith's or Kalt's forceps, or any delicate angled forceps with long approximating surfaces, serve the purpose, but require skillful handling to avoid rupture of the hyaloid membrane.

In the third or mature type, the anterior chamber is again of normal depth, and the lens normal in size but rounder. The capsule is often still too weak in recently matured cataracts for intracapsular extraction by traction, but becomes stronger and more suitable for this operation as these cases approach the hypermature stage. With this exception, mature cataracts may be extracted by any method, if one remembers that

the younger the patient the harder to rupture the zonule, and the older the patient the larger the nucleus is apt to be. Both extremes are probably safer by capsulotomy, especially in less experienced hands.

The fourth or small hypermature stage is not common. Here the anterior chamber is deep, and the lens which is small and round with a thick strong capsule is easily dislocated by attempt at capsulotomy to which it is quite resistant. These cases are perhaps best suited to intracapsular extraction by one of the traction methods, as in intracapsular extraction of any small lens by pressure only, careful manipulation is required, or vitreous will appear in the wound ahead of the lens and make extraction on the spoon unavoidable.

The fifth variety of senile cataract is the thin flattened lens. This is the more common form of hypermature cataract, though the thin lens may occasionally be met with in immature or mature cases. Here the anterior chamber is abnormally deep, the iris often tremulous, and the lens of a perfectly uniform whitish color often slightly tinged with yellow brown. These lenses are much thinner than other forms of cataract, even approaching the disk phonograph record in shape. The capsule is thick and strong, and capsulotomy is contraindicated as it is often so difficult that the zonule gives way rather than the capsule, especially if capsule forceps are used. Intracapsular extraction by pressure only usually ends in spoon extraction with loss of vitreous, as the thin lens cannot be made to fit the wound, and is therefore contraindicated. Intracapsular extraction by traction therefore seems to be the ideal method for these cases. Shrunk membranous cataracts and after cataracts which resist discission, likewise invite intracapsular extraction by traction. This may also be done with a Tyrrel hook through a linear incision, as advocated by Dr. Wilder.

The sixth variety comprises the sclerosed lenses, which are mostly very large nuclei, and occur only in advanced age. They vary in color from light amber with well-marked radiating striæ to almost black. If there is some cortex present they may have a whitish sheen. The anterior chamber is normal or a little shallow, and the pupillary reflex is apt to be sluggish in the darker ones. These require a large section, and

for the average operator, capsulotomy extraction is safest. For the experienced operator the Smith operation is ideal, as these are old patients and the zonule ruptures easily, but the large round lens fits the wound pretty tightly, and a sure technique and a light hand are necessary during the minute or two required for the lens to mold itself sufficiently to pass a full-sized wound. Even after capsulotomy these nuclei often come out molded to an oblong, and with the edges scraped off by the wound. Because of the fragility of the capsule, extraction by traction of large sclerosed lenses would seem to be contraindicated.

The recognition of these six types of senile cataract offers no great difficulty to one who studies his cases carefully. To predict correctly, however, before the operation the size, shape, and consistency of the lens in each case, and the strength of the capsule, advantageous as it is to the operator, requires much experience. Many who saw Colonel Smith operate last year remarked his seemingly almost uncanny ability in this regard. It is of course much easier to the man who is doing intracapsular extraction, as he has the great advantage of being able to check up his prediction in each case by examination of the lens in its entirety in the capsule after extraction. But it can also be done to a considerable degree by the man who is doing mainly capsulotomy operations, if he makes his prediction in every case and checks it by what he finds at operation.

The presence of complications should be a factor in the choice of method. Highly myopic eyes, with their tendency to retinal detachment should have the slightest possible vitreous disturbance, and so perhaps go best by the gentlest capsulotomy operation, with the smallest section which will allow the easy escape of the nucleus. So also eyes with probable disease of the vitreous. Eyes with a tendency to glaucoma, however, seem to be safer with intracapsular extraction, probably because of their freedom from soft lens matter, from blocking of the pupil, and from capsular tags in the wound. Eyes with posterior synechiæ, with tendency to disease of the uveal tract, and perhaps patients with certain focal infections, do better with intracapsular extraction on account of the much greater freedom from postoperative iritis when the capsule is entirely out. This is quite marked in diabetic patients who do

particularly well under intracapsular extraction, though many of them also do well with capsulotomy if made sugar-free before operating. Posterior synechiæ, however, interfere with the use of forceps or the vacuum cup, so that intracapsular extraction by pressure only, if not otherwise contraindicated, is the method of choice. For dislocated lenses, Colonel Smith's method of extraction in the capsule upon the spoon as a fixed inclined plane, given a good operator and a good assistant, produces the smallest possible loss of vitreous, and the largest number of useful eyes.

Having made the choice of operation from the standpoint of the type, maturity and complications of the cataract, and the age of the patient, we have further to consider whether that choice is suitable for the individual patient, or should be influenced by such conditions as the prominence of the eyeball, the size of the cornea, and the probable behavior of the patient during and after the operation. The plump, restless patient with bulging eyes and tightly fitting lids is not ideal for any form of intraocular operation. If the straplike lids cannot be lifted far enough away from the globe to allow ample room for manipulation of instruments, both for extraction and for completing the toilet of the wound, and if the orbicularis cannot be restrained so that under no conditions can the patient make lid pressure on the globe, intracapsular operations are risky and may be disastrous. Under such conditions capsulotomy should be done if not absolutely contraindicated by the type of cataract. In good patients the anterior chamber may be irrigated, but much instrumentation invites trouble. Those cases in which the orbicularis is spasmodically active are perhaps also best handled by capsulotomy, unless they are put well under the influence of bromide, or unless the operator is confident of the ability of his assistant to prevent squeezing and his own ability not to provoke it. On the contrary, poorly nourished patients with sunken deep-set eyes and flaccid lids are ideal for intracapsular extraction. The predominance of this type in India is a real factor in the success of intracapsular extraction there. And it is the opinion of the writer that the frequency of the prominent eye among our well-fed Americans is one of the reasons for the lack of equal success with intracapsular methods here, especially for the

much higher percentage of vitreous loss in unselected routine cases. Colonel Smith believes that overfed patients should be well purged before operation. He also classes the Negro type and the German type, who have no superciliary ridge on the frontal bone, with the prominent eye group.

The small cornea is unsuitable for intracapsular extraction unless the entire section is made well in the sclera, so as to get it large enough. In other words, two to three millimeters of the sclerotic surrounding the small cornea behaves like cornea and must be considered as cornea rather than as sclera, and the section made accordingly. As Colonel Smith says, "Small cornea do not imply small lenses, nor do they imply shallow anterior chambers, and the sclera may always be safely transfixed in these cases." Unless this is done the wound will prove too small, and this is much more serious in intracapsular than in capsulotomy extraction. For this reason, capsulotomy is advisable for the average operator.

Very bad patients require a general anæsthetic, unsatisfactory as that often is. The doubtful ones should be put well under the influence of bromide. The probable behavior of these doubtful ones may be inferred from the way they react to the section and to the iridectomy, and the final choice of method may have to be deferred until that time. In proportion as the behavior of the patient promises to be uncertain, the simpler method of extraction with capsulotomy should be chosen.

The third group of factors influencing the choice of method comprises such conditions as the dexterity, training, and versatility of the operator, and the dependability of the assistant. Mr. T. Harrison Butler said at the last Oxford Ophthalmological Congress: "Operators vary in dexterity, and the same surgeon may operate with more or less skill at different times. Some men charm the lens out, others extract it, not a few express it, and a few paw the lens out. A nervous operator in some telepathic way communicates his mental state to the patient, and is not likely to get good results." While this is true of any method, it has its greatest importance for extraction in the capsule. Likewise the ability to sense what a patient is going to do next, and to maintain that subtle subconscious contact by which the critical moment is tided over in safety.

As to the amount of skill and training necessary to do intracapsular operating satisfactorily, each operator, if he has selected the type of operation best suited to the case, must judge by his results. Some men are handicapped from the beginning in intracapsular work. Such are the heavy-handed man, the timid man who lacks self-confidence and the judicious boldness needed to pull out of difficulties successfully, the man without mechanical or natural operative ability, the man who begins intracapsular work when he is past middle age, the man who has had no personal training such as we have all had in capsulotomy methods and the man who expects to fail. Such men will do well to choose intracapsular methods only for the easiest cases, until they have so far as possible overcome those handicaps.

Extraction in the capsule by any method is more difficult than extraction after capsulotomy, until its entirely different principles are mastered in practice as well as in theory. The question of difficulty, however, will not arise when we are more familiar with it. Like any other slight-of-hand performance, it should be learned before one is too old, and requires not only good hands, but training and keeping in practice. The man who is doing it frequently may perhaps do it on a wide variety of cases with success, but the man who does it rarely will be in difficulties unless he selects it only for the most suitable cases, and has the versatility and the courage to change his method at any stage of operation, if he finds unforeseen conditions make it wise to do so. The more carefully he studies his cases, and comes to know the size, shape, and consistency of the lens beforehand, the less should such change be needed.

The amount of force required, and the question of vitreous escape, have also to be considered in the choice of method. In intracapsular extraction, whether by expression or by traction, (and perhaps expression requires the better hands and the finer and quicker gradation of force), it is the amount of damage done to the eye which determines the suitability of the method. The smallest amount of force which, properly applied, *can* produce the result should rarely need to be exceeded in suitable cases if the section is large enough for the lens. For this reason it is better to err upon the side of a large section, as near one-half the sclerocornea as possible. If then the firmer

zonules are ruptured by traction, rough handling should never be necessary. That many of us have seen injudicious force used while demonstrating intracapsular extraction as a routine operation, perhaps with untrained assistants, and have seen the inevitable results of that force in disturbance or loss of vitreous, iris complications, and iridocyclitis, does not argue that such force is ever necessary in well-selected cases. If one finds that he has selected his operation badly, and the amount of force required to rupture the zonule by pressure or by traction is too great to be wise, he should do a capsulotomy if possible, rather than persist. After the zonule is ruptured, only the very large lenses require much pressure for their expulsion, and these principally where the wound is under 180 degrees. Here the wound should be enlarged or the capsule opened or moderate pressure continued sufficiently long for the lens to mould to the wound, rather than increase the amount of force unwisely. Low tension eyes when relieved of all lid pressure often dimple so greatly to the hook as to make it seem to the bystander that enormous pressure is being used. But the operator knows that he seldom has to use materially more force to express a lens in its capsule after the zonule is free than he would use to express a nucleus of equal size through the same wound, especially if counter pressure be made with the spatula on the sclera well back of the wound, to make the lens come forward.

Escape of vitreous is almost inevitable in extraction of dislocated lenses by any method, but is least in amount by Colonel Smith's method of extraction on the inclined plane. Vitreous escape is frequent in the extraction of small hypermature and very thin lenses by any method, unless it be intracapsular extraction by traction. In capsulotomy methods, vitreous escape is most often due to thick capsules, to prominent eyes, bad patients, orbicularis spasm, and unwise instrumentation: assistance is a minor factor. In intracapsular extraction by pressure vitreous escape is most often due to poor assistance; next, to lack of intracapsular experience or ability, prominent eyes, strong zonules, small sections, and small lenses. Intracapsular extraction by traction probably shows the same causes except insofar as it may handle strong zonules and small lenses better. The factors influencing vitreous escape thus differ

widely in relative importance in different methods, a fact which has not been sufficiently appreciated in statistics. Since escape of vitreous practically does not occur without zonular rupture, it is theoretically facilitated by intracapsular methods where zonular rupture is a necessary part of the operation, and requires greater skill to avoid than in capsulotomy methods, where both the capsule and the hyaloid hold it back. In practice this applies chiefly to fluid vitreous, escape of which is somewhat more frequent in intracapsular than in capsulotomy extraction, but is usually very much less in amount on account of the absence of lid pressure. In fact it is sometimes very difficult to be sure whether a drop of fluid vitreous has really escaped or not, and whether a trace adheres to the lens. Its greater frequency under such conditions is usually more than compensated for by the other advantages of extraction in the capsule. Loss of normal vitreous on the contrary is always serious, or may be so, though less serious when the capsule is entirely out. With properly selected cases, however, a well-trained operator with a good assistant should lose normal vitreous less often by intracapsular methods than by capsulotomy, on account of better lid control. The reverse is true for an untrained operator, or assistant, or with poorly selected or routine cases.

The quality and the dependability of the assistant is an extremely important factor in the choice of operation. For linear extraction little more assistance is needed than for a discission. Capsulotomy extraction in good patients may also go well with little assistance, though if the patient misbehaves or complications arise, most of us prefer a trained assistant with whom we are accustomed to work. Much more so is this true in intracapsular work where absence of lid pressure must be maintained for as long as may be necessary, surely, steadily, unquestionably, but without ever overdoing it so as to cause discomfort to the patient. To do this well, and at the same time keep out of the operator's way, is an art which some assistants learn more quickly than others, the more quickly if the assistant has done intracapsular extraction himself, and has thus a working knowledge of its essential principles and dangers, and the way in which accidents come about. The younger or the

more restless the patient, the more prominent the eye, the more difficult the rupture of the zonule, the tighter the lens fits the wound, and when complications of any sort arise, the more necessary is an assistant who knows the game and instinctively works with the operator instead of against him. In intracapsular operating one is much more at the mercy of his assistant than in any other eye operation. The writer at one time found it a practical necessity to limit his intracapsular work very sharply, as unnecessary loss of vitreous after the lens was out and inability to complete the toilet of the wound, due in large part to a succession of untrained assistants, became too frequent. Later when competent assistance was again available, intracapsular extractions were again done freely, and went as well as ever. The writer at present employs two assistants. One stands behind the operator and holds back the brow and orbicularis with gentle pressure of four fingers. The other at the patient's left, holds the upper lid up and forward on a Fisher lid retractor, and with a bit of cotton under his left thumb pulls down the lower lid by gentle pressure against the lower margin of the orbit. This gives a very satisfactory exposure if firmly and gently done. When the operation is finished, the operator takes the brow and the retractor and eases the lid into place, the assistant relaxing the lower lid last of all. The training of a good assistant is not always easy, and it may be advisable to try a few capsulotomy operations with the lids held well off the globe as for intracapsular work, so that the operator and assistant may become accustomed to working together in the new positions, before attempting extraction in the capsule.

This completes the survey of the more important factors influencing the choice of method for cataract extraction. They have been so briefly outlined that further summary is difficult. In a general way, however, the younger group of patients do better by capsulotomy methods, as do extremely large lenses unless the operator is well trained. Intracapsular extraction by traction requires a strong capsule which is only to be expected in the very late mature and the hypermature cases, and in membranous and after cataracts, though it may be found in some early immature cases also. Intracapsular extraction by pressure requires a reasonably weak zonule and not too

small a lens. This is to be expected in the immature, the swollen, and the early mature stages, especially in older patients. Dislocated lenses and cases complicated by glaucoma or uvéal disease invite extraction in the capsule, as do also sunken eyes. Prominent eyes, small corneæ, bad patients, and cases where extreme gentleness is necessary invite capsulotomy. Better training of both operator and assistant is required for intracapsular than for capsulotomy extraction, and questions of doubt should therefore be resolved upon the side of capsulotomy. When a larger experience has taught us the advantages and the limitations of extraction in the capsule, it will doubtless take its proper place as the operation of choice in suitable cases, for when well done it gives a cleaner, sounder, better lasting eye than extraction with capsulotomy. Especially is this true for the Smith method which, under good conditions approaches the ideal. When we have acquired more intracapsular skill and experience in the various methods, the number of suitable cases may be found very large. But under present conditions, for the sake of our patients, we should choose intracapsular methods only for the cases where they are definitely indicated, and should choose that method which involves the minimum of trauma for that particular case.

Believing that the younger operator should try out intracapsular operating for himself on easy cases, as far as it may be done with safety, it is the hope of the writer that these hints as to the selection of cases and to the avoidance of the more common factors inviting complication, may help to make up to him for the lack of personal training which he has received in the older methods, and that having acquired experience, he will try to select that method for each individual case which is most likely upon that occasion to give that patient, under his conditions and the conditions of the operator, the best seeing, the best lasting, and the best looking eye.

PARALYSIS OF DIVERGENCE WITH REPORT OF THREE CASES DUE TO EPIDEMIC ENCEPHALITIS.

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(With three figures in the text.)

PARINAUD in 1883 gave us the first clear and correct description of paralysis of divergence. As early as 1860 von Graefe recognized as a clinical entity its characteristic symptoms but wrongly interpreted his findings. He believed the trouble to be myopathic in origin. Parinaud and others in the early 80's doubted the correctness of von Graefe's theory and considered the trouble of innervational origin. However, it remained for Duane in 1899 to clearly demonstrate the correctness of Parinaud's contention and to refute von Graefe's hypothesis. Von Graefe, Theobald and other early writers thought the act of divergence to be a purely passive affair brought about by a relaxation of convergence. Consequently they did not believe in the existence of a paralysis of divergence but interpreted these cases as due to a spasm of convergence. We now know that the power of divergence is an active as well as a passive affair which is brought about by a simultaneous equal contraction of both external recti accompanied by simultaneous equal relaxation of both internal recti. This complex action is controlled by a definite nervous mechanism and the loss of this power means an innervational disturbance and not a muscular defect.

Duane has taught us to recognize an homonymous diplopia and convergent strabismus of sudden onset as the cardinal symptoms. This diplopia is peculiar in that it is greatest at a distance of twenty feet or more and diminishes as the eyes are

approached. The separation of the images does not increase in any of the cardinal directions of gaze but remains unchanged so long as the distance between the object and the eyes is constant. A point of binocular single vision is reached at about 25 centimeters from the eyes which is known as the point of single vision by approximation. From this point the test object can be carried away from the eyes for a few centimeters before diplopia is gotten. The most remote point of binocular single vision obtained in this manner represents the point of single vision by recession. For the difference in these distances Alger gives the following explanation:

“Paralyses of divergence automatically result in stimulation of convergence as the fixation point is approached to the eyes. When, however, it is carried away from them, convergence is automatically relaxed and though in this case it cannot be accompanied by any increase in the paralyzed function of divergence, the very relaxation permits some single vision by recession.

The convergent strabismus behaves in an exactly similar manner to the diplopia *i.e.*, it is greatest at a distance and diminishes as the eyes are approached. Measurement of the deviation shows a marked esotropia at twenty feet and only a slight esophoria at thirteen inches. These patients then have binocular single vision at the reading distance but a distressing diplopia beyond this range. There is no limitation of motion of either eye in any field, both eyes being able to move outward in a perfectly normal manner.

PARALYSIS OF DIVERGENCE.

The diagnosis is most commonly confused with a paralysis of the external rectus either unilateral or bilateral. The characteristic feature of a diplopia due to an individual muscle paralysis is its variation in amount in the different directions of gaze. The separation of the images increases markedly in the field of action of the paralyzed muscle. As already stated a diplopia resulting from a loss of the power of divergence remains unchanged in all fields so long as the distance between the object and the eyes is constant. The character of diplopia present in paralysis of divergence, in paralysis of left external

rectus and paralysis of both external recti is shown by the accompanying plottings.

Fig. 1 illustrates the constancy of the distance between the two images in all fields in paralysis of divergence. Fig. 2 gives us a clear picture of the increase in separation of the images on moving the eyes to the left seen in paralysis of the left



FIG. 1.—Paralysis of Divergence.

external rectus, while Fig. 3 shows the increase in both lateral fields obtained in paralysis of both external recti. These diplopia fields were mapped out on a Duane tangent screen at a distance of 30 inches. Limitation of motion in the field of action of the paralyzed muscle is another characteristic sign of muscular paralysis which is absent in paralysis of divergence. An accurate diplopia plotting is our greatest aid in establishing the diagnosis, for a slight limitation of motion may readily escape detection but if any lagging occurs the diplopia increases in that field. A failure to find any variation in the separation of the images in the different fields shows the lesion not to be due to an individual muscle paralysis. Spasm of convergence is frequently confused with paralysis of divergence. If the diplopia or the deviation is due to an excess of convergence it increases as the test object is brought nearer to the eyes and is

negligible at a distance of twenty feet. This is just the reverse of what we have seen happens in paralysis of divergence, where the diplopia or the deviation is greatest at a distance and negligible at close range. A comparison of the distance findings with those at thirteen inches differentiates these two conditions.

The etiological factor in paralysis of divergence remains obscure in the majority of cases. An organic brain lesion appears to be the causative factor in some of them. Syphilis, tabes, multiple sclerosis, lead poisoning and cerebral tumor have been enumerated as possible causes by Duane. Wheeler in view of the acute onset, absence of positive laboratory findings and permanency of the condition considered his case to be the result of a localized hemorrhage brought on by violent physical exertion. Alger has seen the condition occurring in chronic nephritis with high arterial tension and argues from the acuteness of the onset that it was most probably due to a localized hemorrhage in the center of divergence. Duane agrees when he says:

"In the majority of cases the affection occurred without obvious cause although from the suddenness of development and the permanence of the symptoms it seems not unreasonable to infer that it was due to a localized hemorrhage."

Alger reported a case of diphtheritic origin and Cutler has seen it in poliomyelitis. Many ocular muscle paralyses have in the past few years been attributed to epidemic encephalitis. Numerous cases of paralysis of convergence from this cause are recorded in literature so it is surprising that only two authors have reported cases of paralysis of divergence occurring in this disease. Zentmayer in 1919 reported a case of this type and at that time considered it a sequel of influenza, doubtless it was due to epidemic encephalitis. Holden in his article on "The Ocular Manifestations of Epidemic Encephalitis" mentions one such case seen by him. As no complete description of these cases are given I consider it of sufficient interest to report in detail my cases.

The exact location of the center of divergence has long been disputed. Parinaud in his original description located the center in the cerebellum. Cases of paralysis of divergence occurring in cerebellar disease were cited to substantiate this belief. However, as the result of the teaching of Duane we

have come to believe that the location of this center is in the immediate vicinity of the sixth nerve nuclei. The frequency with which paralysis of divergence is followed by involvement of one or both sixth nerves is more than mere coincidence. Also an external rectus paralysis may change into a paralysis of divergence. This tendency towards an interchange of the two conditions is our best argument for the close proximity of the center of divergence to the sixth nerve nuclei.

The prognosis of paralysis of divergence is very uncertain. We are told the majority of these cases remain unaffected by treatment. However, in my opinion it depends entirely upon the cause. If for example it follows diphtheria I should feel encouraged as to the ultimate outcome. The prognosis in cases due to epidemic encephalitis should be extremely guarded. We know that this disease is characterized by periods of long remission so I should not regard a case with this etiology as cured until it had remained without symptoms for two years.



FIG. 2.—Paralysis of Left External Rectus.

Some of the ocular muscle lesions in epidemic encephalitis clear up with surprising rapidity while others hang on with invincible tenacity.

The ideal treatment of paralysis of divergence is one directed

at the cause but usually this is unsuccessful. Our treatment then is at first largely symptomatic. Relief from the distressing diplopia is best brought about by the use of a cover or a ground glass before one eye as in any diplopia. It is not practicable on account of the large amount of deviation in complete loss of power of divergence to correct the diplopia with prisms. When the condition has become stationary operation is indicated. As we have no control over the divergence center our activities must be confined to strengthening the external recti in an endeavor to make them functionate normally with sub-normal stimulation. In my opinion a Reese resection of one or of both external recti is the operation of choice.

CASE NO. I.

S. A., Salesman, age 23.

On March 29, 1922, the patient came under my observation in Dr. John M. Wheeler's clinic at the New York Eye & Ear Infirmary with the complaint of double vision. He went to bed the night before feeling perfectly well and slept all night. On getting up in the morning he noticed everything appeared double. His previous history was negative; he had never been sick before in his life.

V.O.D. = $\frac{1}{2}$ with +0.75 Sph. = $\frac{1}{2}$

V.O.S. = $\frac{1}{2}$ with +0.75 Sph. = $\frac{1}{2}$

The conjunctiva, the lids and the fundi were normal. His pupillary reactions were equal and normal for light both the direct and the consensual, with no reaction to accommodation in either eye. The examination of the ocular muscles showed:

20°¹ Esotropia with alternate fixation at 6m.

8° Esophoria at 30cm.

Near point of convergence (P. c. b.) 115mm.

20° Homonymous diplopia at 6m.

Binocular single vision by approximation at 30cm.

Binocular single vision by recession at 45 cm.

Orthophoria at 15cm.

No limitation of motion of either eye in any field.

Diplopia plotting at 75cm showed no increase in either lateral field (Fig. 1).

Accommodation 1.50 diopters in each eye.

March 31, 1922, two days later, the patient came complaining of headache and drowsiness. The muscle findings were unchanged at this time. A neurological examination

¹ The degree sign means prism diopter.

was made at this time by Dr. Hubert S. Howe with the diagnosis of epidemic encephalitis. Reports from the Wassermann, X-ray of nasal accessory sinuses and urinalysis were negative.

On April 5, 1922, just one week after the onset all diplopia and lethargy had disappeared. Examination at this time showed:

$2\frac{1}{2}^{\circ}$ esophoria at 6m, a prism divergence of 4° at 6m, 2° exophoria at 30cm, and a near point of convergence of 135 mm. His accommodative power was 2 diopters in the right eye and 1.50 diopters in the left eye. This condition remained unchanged for the next three weeks. Examinations made at weekly intervals after this time showed a gradual return of his accommodative power until on July 26, 1922 he had 8.50 diopters of accommodation in each eye and was perfectly well in every respect. The patient remained quiet at home for the first month but at the end of that time resumed work. No medical treatment was prescribed other than small doses of potassium iodide.

CASE No. 2.

A. R., Stenographer, age, 17.

April 19, 1922 the patient came to Dr. John M. Wheeler's clinic at New York Eye & Ear Infirmary with the following history:

She awoke on April 17, 1922 seeing double. The night before she had noticed nothing unusual. For the past week she had had a dull headache and had felt drowsy at night and whenever not actively occupied.

V.O.D. = $\frac{1}{2}\frac{5}{8}$ with + 0.75 Cyl. ax. 180 = $\frac{1}{2}\frac{5}{8}$.

V.O.S. = $\frac{1}{2}\frac{5}{8}$ with + 0.75 Cyl. ax. 180 = $\frac{1}{2}\frac{5}{8}$.

Muscle Findings:

18° Esotropia with alternate fixation at 6m.

18° Homonymous diplopia at 6m.

The diplopia did not increase in any field on the tangent screen.

Binocular single vision by approximation at 45cm.

Binocular single vision by recession at 62cm.

10° Esophoria at 30cm. Orthophoria at 12cm.

Near point of convergence (P. c. b.) 80mm.

No limitation of motion of either eye in any field.

Accommodation 10 diopters in each eye.

Conjunctiva, lids and fundi were normal as were the pupillary reactions to light and accommodation.

April 21, 1922, two days later, she showed:

10° Esotropia at 6m, 3° esophoria at 30cm, orthophoria

at 25cm, binocular single vision by approximation at 65cm and by recession at 1.5m.

April 25, 1922. Has not seen double for the past 48 hours but is still drowsy.

10° Esophoria for distance, prism divergence 1°, 3° esophoria for near. Accommodation 10 diopters in each eye.

June 1, 1922. Patient feels perfectly well.

2° Esophoria, prism divergence 4°, 2° exophoria for near, near point of convergence 90mm. Accommodation 10 diopters in each eye.

Wassermann and all other laboratory tests were negative. Neurological examination made by Dr. H. S. Howe at the end of the first week revealed "no distinct abnormality but I am quite sure she has had a mild epidemic encephalitis." The treatment followed was purely symptomatic. She was advised to remain quiet in bed but only stopped work until the diplopia had disappeared.

CASE No. 3.

I. B., school boy, æt. 12.

January 12, 1921:

Ten days ago (January 2, 1921), patient first complained of a sharp pain "like electricity" starting on the outer side of the right thumb and passing up the outer side of the arm. This pain lasted one minute, disappeared for ten minutes, and then reappeared. The pain was so intense he could not use the arm. Seven days later (January 9, 1921), the patient woke without the pain but felt very weak and felt sleepy all the time. The next day he noticed that everything appeared double when looking at a distant object and only blurred close up. The patient came to Dr. John M. Wheeler's clinic at the New York Eye & Ear Infirmary on January 11, 1921, complaining of double vision and drowsiness.

V.O.D. = $\frac{2}{3}$ with a +1.00 Sph. = $\frac{2}{3}$.

V.O.S. = $\frac{2}{3}$ with a +1.00 Sph. + 0.50 Cyl. ax 90 = $\frac{2}{3}$.

Cornea and media clear, pupils moderately dilated and equal reacting sluggishly to light and accommodation. Interior of both eyes normal.

Muscle Findings:

30° Homonymous diplopia at 6m.

35° Esotropia with the right eye fixing at 6m.

6° Esophoria at 30cm.

Near point of convergence (P. c. b.) 80mm.

Binocular single vision by approximation at 40cm.

Binocular single vision by recession at 50cm.

No increase in the diplopia in any field on the tangent screen.

No limitation of motion of either eye in any field.

Accommodation O.D. 4 diopters. O.S. 3.50 diopters.

All during the examination the patient showed a marked tendency to fall asleep and the responses were gotten only by constantly urging him to pay attention. The diagnosis of paralysis of divergence with a partial bilateral internal ophthalmoplegia due to epidemic encephalitis was made. The patient was referred to Dr. Hubert S. Howe who ad-



FIG. 3.—Paralysis of Both External Recti.

mitted him on January 13, 1921, to Presbyterian Hospital for treatment after confirming the diagnosis of epidemic encephalitis.

Under rest in bed, spinal punctures and symptomatic treatment the patient recovered from all lethargy on January 27, 1921, but still had double vision for which the covering of one eye was advised. Guinea pig injections with the spinal fluid ruled out the possibility of a tubercular infection.

On January 27, 1921, Ocular muscle examination showed:

35° Homonymous diplopia at 6m.

35° Esotropia at 6m.

20° Esotropia at 30cm.

Binocular single vision by approximation at 15cm.

Binocular single vision by recession at 22cm.

Accommodation O.D. 4.50 diopters. O.S. 4.50 diopters. There was evidently a beginning spasm of convergence complicating the paralysis of divergence.

On February 5, 1921, he still complained of diplopia. There had been no change in the lateral imbalance but added to it was 5 of right hypertropia for distance and near. This hypertropia increased to 10° in eyes up and left. The diplopiaplotting showed an increase in vertical diplopia in that field. Evidently there had been an involvement of the superior rectus of the left side.

On February 7, 1921, the patient was discharged from Presbyterian Hospital as diplopia was the only remaining symptom. After being out of the hospital one week the patient had a return of the lethargy accompanied by dysphagia. He was admitted to the hospital on February 28, 1921, and after being in bed for three days he was well again except for the diplopia. He was discharged from the hospital on March 16, 1921, at which time he was not seeing double. The muscle tests showed: 13° esophoria at 6m, 10° esophoria at 30cm, no hyperphoria for distance or near, prism divergence 2° ; no diplopia on the tangent screen.

On April 2, 1921, he showed 6° esophoria at 6m, prism divergence 4° ; 2° esophoria for near, and a near point of convergence of 80mm. Accommodative power 12 diopters in each eye. This condition persisted until June 22d, when after a fit of anger the patient suddenly had a return of the diplopia. Examination on June 25, 1921, showed:

16° esotropia in the primary position for distance and near. Plotting on the tangent screen showed an increase in diplopia in eyes right and in eyes left indicating the existence now of a bilateral external rectus paralysis. (Fig. 3.)

Accommodative power was right eye 6.00 diopters, left eye 5 diopters. The diplopia persisted about ten to twelve days then cleared up.

July 19, 1921:

Examination showed 3° esophoria for distance, prism divergence of 4° ; esophoria 5° for near. Near point of convergence 90mm. Accommodative power 12 diopters in each eye. The patient had been entirely free from all symptoms up to May 15th, 1922, when last heard from.

Ophthalmoscopic examination has at all times been negative and the vision in each eye always been correctible to $\frac{3}{8}$.

This case report shows the complexity of the ocular muscle lesions in epidemic encephalitis. For in addition to a paralysis of divergence he had a bilateral partial ophthalmoplegia interna, a paresis of the left superior rectus, and finally in a recurrence it took the form of a bilateral external rectus paralysis.

I wish to thank Doctor John M. Wheeler for the privilege of reporting these cases and also to express my gratitude to

Doctor Hubert S. Howe for his careful neurological examinations.

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BITEMPORAL CONTRACTION OF VISUAL FIELDS IN PREGNANCY.¹

BY PROF. C. E. FINLAY, HAVANA, CUBA.

ON February 15, 1919, a case was sent to me in consultation which gave rise to the investigations which form the subject of this paper.

Its clinical history was as follows:

Mrs. E. P. M., æt. 24, a leading society lady in the 8th month of pregnancy, had suffered a month previously a severe attack of influenza; after recovery she had developed a series of seizures of a cataleptic nature; during which she could not move, though perfectly conscious of what was going on around her. My examination of her eyes resulted as follows:

Corneæ and conjunctivæ, normal; media, clear; pupillary reactions, normal; fundi (both), slight contraction of retinal arteries and dilatation of retinal veins; visual acuity (both), $\frac{2}{8}$; visual fields, temporal contraction (more pronounced on right side) for white, with marked concentric contraction for colors, the red field being larger than that for blue, there being also a crossing of the limits of the color fields on the left side.

I concluded that there existed a hypophyseal compression of the chiasm, but was at a loss as to whether this was due to a hypophyseal tumor or to an enlargement of this organ in connection with pregnancy, and as to whether the cataleptic seizures were due to the enlargement of the hypophysis or of a hysterical nature. The further history of this case has no particular bearing with this paper, the seizures continued

¹ Read at an International Congress of Ophthalmology, Washington, April, 1922.

after confinement and some of the experts who later saw the patient thought there was some endocrinic disturbance with hysterical manifestations. But the study of the case made me seek to determine whether the normal hypertrophy of the pituitary body which takes place in connection with pregnancy was of such a degree as to determine changes in the visual fields. Through the courtesy of Professor Bustamante, in charge of the Maternity Clinic of the General Calixto Garcia Hospital, I proceeded to examine the visual fields of a number of women awaiting confinement, selecting only cases that presented no general complications, with normal eye-grounds and perfect visual acuity.

The following are the reports of the 31 cases examined¹:

CASE 1.—E. E., white, æt. 20, Cuban, pregnancy 8 months, urine normal, fundi normal, visual acuity $\frac{3}{8}$; visual fields: marked contraction, more marked in temporal half; more pronounced on left side.

CASE 2.—J. G., white, Spanish, æt. 22, 9 months pregnant; urine normal, no alb., sp. gr. 1020; fundi normal; visual acuity (each) $\frac{3}{8}$; visual fields practically normal.

CASE 3.—J. F., Cuban, mulatto, æt. 36, 9 months pregnant; urine normal; no alb., sp. gr. 1009; visual acuity (each) $\frac{3}{8}$; visual fields: marked bitemporal contraction. This patient had a normal labor on August 16, 1920, and a second examination 10 days later showed a slight reduction in the bitemporal defects.

CASE 4.—L. A., Cuban, negress, æt. 16, 9 months pregnant; urine, no alb., sp. gr. 1011; fundi, normal; visual acuity (each) $\frac{3}{8}$; visual fields: marked bitemporal contraction.

CASE 5.—A. G., Cuban, negress, æt. 16, 7 months pregnant; urine: trace alb., sp. gr. 1015; fundi: normal; visual acuity (each) $\frac{3}{8}$; visual fields: bitemporal contraction.

CASE 6.—R. G., white, Cuban, æt. 21, 9 months pregnant; urine: trace alb., sp. gr. 1023; fundi: normal; visual acuity $\frac{3}{8}$; visual fields: very slight contraction (R), slight contraction (L).

¹ The charts of the visual fields of all these cases can be found in the volume of the *Transactions of an International Congress of Ophthalmology*, Washington, April, 1922.

CASE 7.—C. C., Cuban, mulatto, æt. 29, 8 months pregnant; urine: trace alb., sp. gr. 1020; fundi: normal; visual acuity (each) $\frac{2}{8}$; visual fields: very pronounced concentric contraction, greater in temporal half.

CASE 8.—C. V., Cuban, mulatto, æt. 37, 9 months pregnant; urine: no alb., sp. gr. 1031; fundi: normal, visual acuity (each) $\frac{2}{8}$; visual fields: marked bitemporal contraction, more pronounced on left side.

CASE 9.—G. S., Cuban, negress, æt. 37, 9 months pregnant; urine: no alb., sp. gr. 1018; fundi: normal; visual acuity (each) $\frac{2}{8}$; visual fields: moderate bitemporal contraction.

CASE 10.—M. C., white, æt. 38, 8 months pregnant; urine: no alb., sp. gr. 1024; fundi: $\frac{2}{8}$; visual acuity (each) $\frac{2}{8}$; visual fields: marked bitemporal contraction.

CASE 11.—C. G., Cuban, mulatto, æt. 28, 8 months pregnant; urine: no alb., sp. gr. 1016; fundi: normal; visual acuity (each) $\frac{2}{8}$; visual fields: moderate bitemporal contraction.

CASE 12.—M. S., Cuban, White, æt. 14, 5 months pregnant; urine: trace alb., sp. gr. 1016; fundi: normal; visual acuity (each) $\frac{2}{8}$; visual fields: slight temporal contraction (R), moderate temporal contraction (L).

CASE 13.—M. C., Cuban, white, æt. 18, 9 months pregnant; urine: trace alb., sp. gr. 1012; fundi: normal; visual acuity (each) $\frac{2}{8}$; visual fields: marked bitemporal contraction.

CASE 14.—A. I., Cuban, negress, æt. 17, 8 months pregnant; urine: no alb., sp. gr. 1012; fundi: normal; visual acuity (each) $\frac{2}{8}$; visual fields: moderate bitemporal contraction.

CASE 15.—F. A., white, æt. 23, 9 months pregnant; urine: trace alb., sp. gr. 1030; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: practically normal.

CASE 16.—S. A., white, æt. 25, 9 months pregnant; urine: no alb., sp. gr. 1022; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: slight bitemporal contraction.

CASE 17.—V. A., Cuban, negress, æt. 18, 9 months pregnant; urine: no alb., sp. gr. 1005; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: slight bitemporal contraction.

CASE 18.—N. M., Cuban, mulatto, æt. 31, 9 months pregnant; urine: no alb., sp. gr. 1030; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: practically normal.

CASE 19.—C. H., Cuban, negress, æt. 28, 9 months pregnant; urine: no alb., sp. gr. 1012; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: normal.

CASE 20.—G. G., Cuban, negress, æt. 31, 9 months pregnant; urine: normal; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: slight bitemporal contraction.

CASE 21.—J. B., Cuban, mulatto, æt. 39, 9 months pregnant; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: moderate bitemporal contraction.

CASE 22.—F. I., Spanish, æt. 25, 9 months pregnant; urine: no alb., sp. gr. 1012; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: slight bitemporal contraction.

CASE 23.—C. F., Cuban, negress, æt. 16, 9 months pregnant; urine: no alb., sp. gr. 1010; visual acuity: $\frac{2}{8}$; visual fields: slight temporal contraction (R).

CASE 24.—P. R., Spanish, æt. 36, 8 months pregnant; urine: trace alb., sp. gr. 1023; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: slight temporal contraction (L).

CASE 25.—B. P., Cuban, mulatto, æt. 18, 8 months pregnant; urine: no alb., sp. gr. 1012; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: slight bitemporal contraction.

CASE 26.—M. O., Spanish, white, æt. 22, 8 months pregnant; urine: trace of alb., sp. gr. 1020; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: slight bitemporal contraction.

CASE 27.—A. A., Spanish, white, æt. 34, 9 months pregnant; urine: no alb., sp. gr. 1026; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: normal.

CASE 28.—V. S., Cuban, negress, æt. 22, 9 months pregnant; urine: trace alb., sp. gr. 1018; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: normal.

CASE 29.—C. L. V., Cuban, white, æt. 17, 8 months pregnant; urine: no alb., sp. gr. 1025; fundi: normal; visual acuity: $\frac{2}{8}$; visual fields: practically normal.

CASE 30.—A. P., Cuban, mulatto, æt. 19, 9 months pregnant; urine: no alb., sp. gr. 1016; fundi: normal; visual acuity: $\frac{2}{80}$; visual fields: normal.

CASE 31.—F. P., white, æt. 28, 8 months pregnant; urine: trace alb., sp. gr. 1031; fundi: normal; visual acuity: $\frac{2}{80}$; visual fields: normal.

From an examination of these visual fields we find that out of the 31 cases examined only 9 could be considered approximately normal; the remainder showing changes in the nature of a temporal contraction; of these 8 were slight, 9 moderate, and 5 pronounced.

These surprising results led me to a thorough study of the literature at hand in connection with the anatomical and other data requisite for a complete explanation.

For a long time I was under the impression that the observations were the only ones made in this connection, but I eventually discovered that changes in the visual fields of a similar nature to those which I have recorded have been published first by Bellinzoma and Tridondani (*Bollet. dell. Soc. med. chir. di Pavia*, 1903), and later confirmed by Forti (*Arch. di Ottalm.*, Feb., 1910), which they all attributed to dynamic or vasomotor disturbances similar to those occurring in hysteria.

This more or less forced explanation seems to me unnecessary, as the changes described can be perfectly explained by the mechanical pressure brought to bear on the chiasm by the enlarged pituitary gland, resulting from the normal hypertrophy of this organ which occurs in pregnancy. The gland increases 2 to 3 times its weight and volume during this state (Shäfer, *Endocrine Glands*, London, 1916, p. 115), this being due to increase in number of oxyphil cells (*Schwangerschaftszellen*) in the "pars anterior" (Erdheim & Sturm and Emory Hill, *Am. Encyclop. of Ophth.*, xiii., p. 10232); a good many of the disturbances occurring in connection with pregnancy being probably due to the corresponding hyperfunction. For the chiasm, which is situated over the center of the "sella turcica" and not in contact with its anterior border from which it is separated by a reflexion of the dura mater (*cisterna chiasmatis*), from behind and below by an enlarged hypophysis, this must attain at least a volume of 0.5.

The differences in the degree of the changes in the visual fields depend on the degree of hypertrophy and on anatomical peculiarities which may favor or hinder the above mentioned compression.

In conclusion I consider I can establish:

That during pregnancy there often occurs, as a result of the normal hypertrophy of the pituitary gland in connection with this state, a compression of the chiasm which manifests itself by changes in the visual fields in the nature of a bitemporal contraction which varies in degree according to the amount of compression suffered, this depending on the corresponding amount of hypertrophy and on the anatomical peculiarities of the case which may favor or hinder this compression.

After the session at which I read my paper, Dr. Blaauw, of Buffalo, handed me a note in which mention is made of a paper of Igersheimer at the meeting of the Heidelberg Society in 1916, where he mentions the changes in the hypophysis in pregnancy and the bitemporal hemianopic symptoms which occur in consequence at least in the last month of pregnancy mentioning 12 cases. I had not come across Igersheimer's paper, nor found any reference in the periodicals at my command. I gladly take this opportunity of correcting the omission in my brief survey of the literature. The original paper I have not seen, but have since the Congress found a brief extract of Igersheimer's paper, in the *Klinische Monatsblätter*, on lesions of the optic nerve where mention is made of possible changes of a hemianopic nature in hypertrophy of the hypophysis, in pregnancy, etc.

ABIOTROPHY: OPHTHALMOPLEGIA EXTERNA.

By DR. A. W. STIRLING, ATLANTA, GA.

IN view of the prominence given to such cases by Treacher Collins at the recent International Ophthalmological Congress in Washington, this seems an appropriate time to publish the following records:

CASE 1.—Miss A. R. S., then aged 24, consulted me in December, 1919, on account of abnormality in the movement of the eyes and rather mediocre vision. The refraction was examined under homatropine and cocaine and the following glasses were ordered:

R. E. + .75 D Cyl. Axis 30 degrees (down and in) $\frac{5}{8}$.

L. E. + .50 D Cyl. Axis 60 degrees $7\frac{5}{8}$. No fundus changes could be found.

The patient's main complaint, however, was an inability to move her eyes like ordinary people, which it seems was laid to the account of a hornet sting in the eye of her mother when six months pregnant.

My notes made at the time say "Ophthalmoplegia Externa (not complete) in both eyes, sometimes (generally) cross. Eyes can be turned to the side at times and not at others, and better when not thinking about it, worse when trying to look to right. The weakest muscle is the right external rectus. On looking with care as at test letters the right eye jumps from side to side; the left not so badly. Sees with either eye alternately, and not with both together. (As demonstrated by Red-Green FRIEND.)"

On July 29, 1922, I had the opportunity to see her, when I made the following notes:

The belief in her family is that she was born with eyes crossed and more or less immobile. The immobility never entirely disappeared, but she thinks that when she is unconscious of her eyes they turn more freely. She says they are perhaps better than ten years ago, but this is very doubtful. I see no improvement in three years. She always

could open and close the eyes quite normally, and there has never been any difficulty in focussing for near objects, neither has there been any paresis of shoulder or other muscles. She is a big strong-looking young woman in "absolutely perfect health."

No other member of the family is known to have had any such peculiarity as hers. On examination it appeared at first as if the right eye were usually turned a little in and up, but later observation made it doubtful whether she used one eye more than the other, one always turning in a little, perhaps 15 degrees at the most, but not to any constant extent and at times they are almost straight. She has never observed any diplopia.

A point of much interest is the difference in mobility of each eye in dependence upon whether or not the other is covered. When both are uncovered there is no movement whatever in the right eye outward; but it turns in about half the normal distance and very slightly upwards and downwards. When the left eye is covered the right will follow the finger a considerable distance, half way or more of the normal, outwards, and farther in than when both are uncovered. Covering the one has no effect on the upward and downward movements of the other. With both uncovered the left eye does not follow the finger at all in any direction; but when the right is covered the left follows the finger till the cornea touches the internal canthus. It does not, however, turn at all beyond the center in any other direction. The alternation of strabismus from one eye to the other, already noted, probably therefore always occurs during blinking.

If both eyes are uncovered and the left is turned in when the finger is carried to the right the left would be the fixing eye at a certain position, but except there neither would see it clearly. When the finger is moved to the left, the right eye being turned in could obtain clear vision but only over the limited range of its movements. It is interesting that though the vision with both eyes uncovered can be no better than with only one, an effort as effective could not be made to obtain clear vision in all positions with both open as with only one open. When one eye is covered the effort to follow the finger seems disproportionally successful, as if the motor centers were relieved of some handicap when one eye is closed. (She is constant in stating that the eyes move better when she is not thinking about them.) The weakness in such a case would appear, therefore, to be not altogether in the muscles.

(To-day, Sept. 16th: Since writing the above, Miss S. has consulted me about an abscess on the left lower lid. I took the opportunity to examine the ocular movements, and

found on this occasion that though on the last examination the conditions were as stated above, confirmed by Dr. J. Calhoun McDougall, to-day there is limited but distinct lateral movement of the left eye, which, however, is still much wider when the right is closed.)

It is also noteworthy that the patient's parents who are both alive (and her father is a doctor) seems to be convinced that their daughter's eyes have been peculiar since birth. I quote from a recent letter from her father: "Some peculiarity in R.'s eyes was apparent in her earliest infancy, but not that she did not move them normally, only that instead of looking directly at an object, she turned her head to one side (about 15 or 20 degrees) as if to focus more readily. Dr. T. saw her when she was about 3, and a number of times afterwards. If he perceived any disability of this nature (moving her eyes) he did not mention it. He thought the trouble would grow less with age, as indeed—apparently at least—it has. He also said that her trouble was undoubtedly congenital. My wife has always been unalterably of the opinion that this peculiarity was attributable to prenatal impression—she having suffered extremely from the sting of a wasp on the eyeball, about the sixth month of pregnancy before R.'s birth. R. has never had, at birth or other time, any wound about the head."

I wrote Dr. T. but he states that his record of this case has been lost.

CASE 2.—Mrs. A. T. B. (then Miss A. S., age 24) consulted me in November, 1911, at the instigation of another ophthalmologist. Her trouble had begun about two years before and she had been treated with no avail since then by various specialists who seem to have prescribed mainly mercury and potassium iodide. My notes made at the time state that she had "occasional nearly complete ptosis and ophthalmoplegia externa," and that "she gets 'quite well' at times." Pupils active to light and accommodation. "Eyes move *a little* in all directions; do not converge well. Left ptosis; eye half shut and cannot open it; never any other paresis. Fundus normal."

This patient lives in a small country town several hundreds of miles away; but she has kindly answered a series of questions which I sent her and besides has written me letters at considerable length.

Her family history appears to hold nothing of interest. As regards her own health the only complaint is a weakness and pain in the back due to a "falling of the womb" which was discovered two years ago when she had a miscarriage ("a

fine strong baby") two years after marriage, and which her symptoms and the doctors suggest had existed for a long time. "This," she says, "without a doubt has been the cause of all my eye trouble."

She states that she believed no one ever had stronger eyes until she was 22, when she thought a piece of grit flew into her eye, though no one could see it next day. The eye seemed very weak and continued so. In ten days she visited an eye specialist who wanted to operate on the muscle of her lid and prescribed glasses. She also consulted the late Dr. Graddy of Nashville, Tenn., and, through the courtesy of his successor, Dr. E. B. Cayce, I am able to give his notes made first on November 18, 1909.

"Miss A. S., age 24" (my notes say she was 24 in November, 1911) "three years ago suffered from diplopia, ptosis, headaches, etc. Eyes then corrected, treated, and relieved by Dr. D. One year ago last July, returned to him for treatment and glasses changed to full correction but no relief followed. Condition at present:

"Right with glasses on $\frac{7}{16}$.

Left with glasses on $\frac{8}{16}$.

Wearing plus 1.50 D sp.

At 20 feet es. 15 L. H. 10. Diplopia.

April 1, 1910. Right-vision $\frac{7}{16}$.

Left-vision $\frac{8}{16}$.

"Only an occasional diplopia for short time. At 20 feet es. 4, vert. orth. Adduc. 3, abduc. 10."

I have tried to get notes of this case from two others who saw her, but they could find none.

She seems then to have consulted a number of other ophthalmologists in different cities and at least one nerve specialist who apparently advised drugs which did not; however, prevent the onset of "very bad" double vision. These symptoms later partially or wholly disappeared, and indeed she thinks she was quite free from them for a period of "two to four months." But two years after this first appearance the symptoms she says got bad again. "I could scarcely open the left eye at all and the right eye would open wider as the left lid drooped, and I was very weak and nervous, would have weak spells as though I had no life in me."

Some eight years ago she decided that doctors could not help her, though she has "the kindest feelings toward them," and her symptoms have continued apparently with much the same irregularity as before. She states that "from the beginning up to the present time (June, 1922) my left eyelid will only partly raise. Sometimes this only lasts one

day, and then 'tis weeks, perhaps months until it is weak again. If I am not feeling very well, this is when it most frequently is wrong, and it is not always standing at the same place. Sometimes it is almost closed; at other times only droops slightly. The right lid has never drooped as bad as the left lid; in fact has never given any trouble only a few times at the beginning. It is much the stronger of the two eyes." (I quote from the patient's letters because they so clearly bring out the variability in the degree of the paresis.) "I can't give any exact dates of the trouble, because they have varied so much, and one day may appear so bad and much better the next. Reading by lamplight causes my eyes to feel weak and then the lid will droop until I close it for awhile. The difficulty in moving my eyes from side to side began right away after the first trouble. The right eye moved much farther than the left, and that made the double vision when they did not move together. I don't have double vision all the time, and near-sightedness is fast growing in my left eye. I can see much better looking to my right side than to my left. I can look down with both eyes moving together, but when I look up the right moves quicker and raises, and the left ball does not move as far upward as the right. None of my eye trouble has entirely disappeared, but all are very much better." (Miss A. R. S., Case 1, also thought she was better, but I could not confirm this on examination, and the better feeling is probably due to acquired freer head movements replacing those of the eyes.) "When my eyelids seem the strongest that doesn't make the movements of the eyes any easier. Yes, it was the left eye that turned in, but I don't think this occurred more than twice, for a period of two or three weeks, and at this time I almost looked to be cross-eyed (which would mean about as much as being blind to me)."

As Mr. Treacher Collins points out the abiotrophies of the external ocular muscles may be divided into several groups which must be distinguished from congenital defects of movement due to anatomical anomalies. There are (1) The facio-scapular humeral type, a family hereditary disease transmitted by either parent and affecting both sexes: The ocular defect is a paralysis of the orbicularis palpebrarum. (2) A type in which a bilateral progressive ptosis is the only symptom, beginning in early life and hereditary, or not appearing until an advanced adult age. The cases so far reported have been females. (3) Four generations of one family showing ophthalmoplegia externa beginning always in adult life. The levators were completely paralyzed and the recti have a very limited action; and (5) a series of cases whose onset was generally in infancy or early childhood,

sometimes later, and were characterized by an intermittent but slowly progressive paralysis of all the external ocular muscles generally ending after many years in their complete paralysis. Ptosis is usually the first and may long continue the only symptom.

Both of my cases appear to belong to the last group, but Case 1 has certain noteworthy characteristics. Thus, there is no ptosis and there never has been; her parents are unshakable in their stand that the condition of her eyes was congenital; and so far as I know no record has before been made of the effect of closure of one eye upon the latitude of movement of the other.

In Case 2 it will be observed that ptosis ushered in the trouble, and not until she had reached the adult age.

THE LAW OF ROTATION OF THE ASTIGMATIC AXIS.

BY DR. A. W. STIRLING, ATLANTA, GA.

THE "Rule" which is applied to the axis in astigmatism should apparently be supplanted or modified in favor of another which seems to be much more nearly worthy of the name. Instead of stating that the cylinder axis in hypermetropia is generally vertical and in myopia generally horizontal we should be nearer the truth if we said: "The axis of the correcting lens in hypermetropia tends with age to rotate from the vertical toward the horizontal, and in the opposite direction in myopia."

Two years ago I published a preliminary paper,¹ and in 1921 another² dealing with 544 eyes, which demonstrated clearly enough the above proposition. Thus taking the ages by decades the axes of the correcting cylinders more nearly horizontal than vertical in hypermetropia were in percentages: I, 0; II, 10.5; III, 11.6; IV, 23.1; V, 27.0; VI, 55.9; VII, 70.2; VIII, 76.6; IX, 100.0. In myopia the same percentages were: I, 100.0; II, 69.3; III, IV, and V combined 53.8; VI, 40.0; VII, 37.7; VIII, 0.

One must conclude from these figures that the cylinder axes have a strong tendency to rotate with age in the direction indicated.

I said in the latter of the previous articles, "another method of investigating the question of this axial rotation would be through the histories of the same eyes during long periods." This is the object of the present paper, founded upon a series

¹ "Astigmatism—Especially with Regard to the Influence of Age upon the Axis." *British Journal of Ophthalmology*, vol. iv., No. 2, Nov., 1920.

² ARCHIVES OF OPHTHALMOLOGY (New York), vol. 1., No. 1, 1921.

of cases which have come up for examination during the last few months. All in this as in previous communications have been private cases. The method of procedure since beginning this last observation has been to mark down at the time of the examination the name of each and every patient with healthy eyes whose axis had changed since a previous examination. These I have since tabulated under a number of headings as will appear in the conclusions to be stated, but it would unnecessarily cumber these pages to reproduce in them a detailed statement of the figures.

Some of the cases had been under my care for many years, from 2 to 17, with an average of $7\frac{1}{2}$ years.

The most important observation to be gleaned from a study of these tables of figures is that they emphatically endorse the conclusions previously arrived at by noting and comparing the positions of the cylinder axes at various ages. For (with the exception of three cases) every rotation is in accordance with the law already suggested that the cylinder axes tend to rotate toward a point which might be called the Position of Rest.

It is also worthy of note that the change of axis is gradual, and never by lengthy leaps and bounds. This I have observed as a general impression, and upon examination I find that for the thirty-nine cases recorded the average rotation in degrees for the right eye was seventeen and for the left nineteen. As the average interval between the first and last examinations was 6.4 years, we deduce an average annual rotation for the right eye of 2.7 degrees and for the left of practically 3 degrees.

In eleven of the cases one or more examinations had been made between the "first" and the last. These are worth quoting as they illustrate the gradual progression of the rotation. The axes of the following hypermetropic eyes varied thus in degrees at succeeding examinations:

Case V.	L.E.	90,	105,	135
Case VI.	R.E.	90,	105,	105
Case VIII.	L.E.	90,	75,	60
Case XIII.	R.E.	90,	105,	120
Case XX.	L.E.	70,	45,	15
Case XXIII.	R.E.	45,	30,	30
	L.E.	45,	45,	30

Case XXVIII.	L.E. 160, 120, 160, 165, 165, 180 R.E. (Constant at 120 during 13 years.)
Case XXX.	L.E. 90, 60, 30
Case XXXIV.	R.E. 75, 45, 20, 180 L.E. 115, 165, 165, 180
Case XXXVIII.	L.E. 90, 105, 115
Mrs. L. C. K.	R.E. When 44 years old at 90; when 45 at 100; when 46 at 120. L.E. When 44 years old at 105; when 45 at 105; when 46 at 110. (This case came in for examination since this paper was completed and is not included in it.)

On examining old records I have observed the occasional apparent development of an astigmatism which was not discovered in the earlier examinations. The following is an example. Previous refractions were made 11, 9, 8, 7, 5, 4, and 2 years before on the eyes of Mrs. T. C. before astigmatism was found. There was only a mild degree of hypermetropia. Then the R.E. showed plus .25D. Cyl. axis 120 degrees. A year later the R.E. had plus .50D. at 150 degrees, and the L.E. plus .25D. at 120 degrees. Six years afterwards the R.E. had still plus .50D. at 150 degrees and the L.E. had plus .50D. at 150 degrees.

A considerable number of the cases were under observation for a period longer than that named as the interval between the first and last examination, the "first" actually meaning the examination previous to that at which a change of axis had been noted. Many of them, however, had already undergone one or more examinations in which the axis had been the same as that at the "first." This was true of 12 cases with an average of nearly two examinations each during an average of about four years previous to the "first" examination.

I had been of the opinion that it was rare for any change of axis to occur in young people, and taking age in decades my case figures show rotation to have begun in the following order: In Decade I, 0; II, 1; III, 3; IV, 6; V, 16; VI, 13.

Since completing this paper, Mr. J. M. has come in for examination, and though this case is not included in its figures

it is worth quoting as an example of the initial stages of the rotation:

At ages 41, 43, and 47 the axes of both hypermetropic lenses were at 120, at 49 (the present examination) the right was still at 120, but the left was at 135.

Experienced ophthalmologists are well aware that despite the greatest care errors are bound occasionally to creep into the results of examinations for refraction, and that not infrequently on account of inaccuracy of observation on the part of the patient. All that the writer can claim is an unvarying desire to give the best correction possible, stimulated by the observation that while there is little glory to be garnered in this sphere of work, taken all around it opens for us at least as much opportunity as any other for dealing out comfort or discomfort to our patients. If there are errors in these refractions they can hardly suffice to vitiate the general trend of the figures, and one might claim that they are more likely to be present where they seem to run counter to an apparent law rather than where they uphold it. That the glasses ordered at least gave better than what is called normal vision ($\frac{5}{8}$ is undoubtedly not up to the standard of normal vision) is proved by the following figures: the first examination gave for the 78 eyes 29 with $\frac{5}{8}$, 33 with $\frac{6}{8}$, 14 with $\frac{7}{8}$, 1 with $\frac{6}{7.5}$, 1 with $\frac{5}{8}$; the last examination gave 46 with $\frac{5}{8}$, 21 with $\frac{6}{8}$, 9 with $\frac{7}{8}$, 2 with $\frac{6}{7.5}$. The better results at the last examination are probably due to the fact that the illumination of the test types had been improved in the interval between at least some of the "first" and last examinations. (The figures $\frac{5}{8}$ and $\frac{6}{8}$, etc., do not always mean that the patient could read every letter of that line, but that his vision was more correctly indicated by them than by any other.)

The first case which is contrary to the general rule (Case XV) was a man of 43 at the first examination and 58 at the last. At both examinations the refraction of the right eye was plus .25D. Cyl. axis 145 degrees (down and out)— $\frac{5}{8}$, of the left at the first examination it was plus 1.75D. Cyl. axis 100 degrees— $\frac{5}{8}$ partly, at the last it was minus .25D. Sph. on plus 1.75D. Cyl. axis 90 degrees— $\frac{5}{8}$ partly.

The second was a lady of 39 at the first and 42 at the last examination. The right cylinder plus .75D. was at 180

at both examinations, and the left which was plus .75D. axis 180 degrees at the first examination had changed to plus .50 axis 150 at the last. Vision was $\frac{3}{4}$ at each examination.

The third was a lady 44 and 50 at the first two examinations which were identical and 53 at the last. The refraction of the right eye at the first was plus .50D. Sph. on plus .50D. Cyl. axis 105 degrees (down and out)— $\frac{3}{4}$, and of the left plus .50D. Sph. on plus .75 D. Cyl. axis 75 degrees (down and in)— $\frac{3}{8}$. At the last examination the right refraction was plus .75D. Sph. on plus .50D. Cyl. axis 80 degrees— $\frac{3}{4}$, and the left plus .75 D. Sph., on plus 1.0D. Cyl. axis 75 degrees— $\frac{3}{4}$. But at an intermediate examination two years before the last the right axis was 90 degrees, an interesting rotation (105, 90, 80) toward correspondence with the left which has been constant at 75 degrees.

Besides the change in axis the last examination showed differences from the "first" as follows:

Of the 78 eyes 60 had slightly altered. Of these changes 34 affected spheres alone (usually a slight increase in convexity), 13 cylinders alone, and 13 both spheres and cylinders. The convexity of cylinders was changed therefore in 26 or $\frac{1}{3}$ of the eyes. Of these the strength was decreased in six by an average of .33D. and the increase of the others averaged .27D.

My last article contained no direct argument bearing on the question of the constancy in the amount of astigmatism in individual eyes, but so far as they go the present figures show some tendency toward change, which is not surprising. Indeed it would perhaps be more remarkable did the amount always remain constant in eyes in which the axis changed.

This introduces the question of ætiology. In my last article I remarked on the fact that the rotation might be due to either cornea or lens, and mentioned that if it were corneal the cause might possibly lie in the force of the external ocular muscles exerted in such movements as those entailed in reading; while if it were lenticular the cause might be found in an irregular sclerosis of the lens, though it was hard to see why that should produce a rotation of the axis so commonly in one and the same direction.

Since writing the previous article it has occurred to me that a possible explanation might be found in a change in the zonule

permitting an alteration in the position, a tilt, of the lens, or in its form. Such a hypothesis does not appear absurd when one considers the constant rapid movement of the majority of eyes, and remembers that the zonule may undergo, and we know does at times undergo, a degeneration which weakens its fibers and perhaps not equally at all points.

The ophthalmometer would appear to supply the best means whereby one might separate corneal from lenticular astigmatism, and possibly someone who still makes a routine use of this instrument may be able to supply data which would help to settle the question. After using it for some years as an apparently necessary adjunct to a consulting room I long ago discarded it, and am therefore not in a position to compare the corneal with the total astigmatism in all the cases recorded in these articles. Theoretically the instrument should give precise results, but it has never been to me so minutely reliable that I would care in such a case as this where absolute accuracy is essential to make any definite statement founded upon its showings alone.

I have recently made with an ophthalmometer belonging to a friend an examination of some of the eyes considered in this paper, but so far I have been unable to find sufficiently reliable evidence upon which to found a decision on this aspect of the question.

METASTATIC THYROID TUMOR IN THE ORBIT.¹

BY DR. ARNOLD KNAPP, NEW YORK.

(With two illustrations on Text-Plate I.)

COHNHEIM was the first to recognize that a struma may cause metastases, and called them metastatic benign strumas. These metastases occur in the bones and in the lungs. Why they seem to select the bones is unsettled; A. Muller believes that the medulla of the bone furnishes a favorable site for their growth because of its retarded circulation. Thyroid gland cells are unusual, in that they are capable after entering the circulation to remain viable, and in certain places proliferate and form tumors. Trauma plays here a definite rôle. Striking is the destructive power of these metastases, which is particularly evident in the bones. This destructive tendency, the formation of metastases, and recurrences, cause some authors to regard them as essentially malignant. The thyroid in some of these cases seemed perfectly normal. The tumor, may, of course, be overlooked in the thyroid gland.

Schmidt ("Zur Kasuistik und Statistik der Knochentumoren mit Schilddrüsenbau," *Inaug. Diss.*, Rostock, 1906) has collected 49 cases of struma metastases. In the metastasis, careful search reveals a carcinomatous part in the normal thyroid gland tissue. The site of these metastatic thyroid gland tumors is in various bones, particularly the cranial bones. Twenty-nine metastases occurred in the skull, principally in the frontal and parietal bones; in the vertebral bones, 16; in the ribs and shoulders, 4; in the pelvis, 11; in the femur, 7; in the humerus, 6. The size varies from that of a

¹Read before International Congress of Ophthalmology, Washington, D. C., May, 1922.

ILLUSTRATING DR. KNAPP'S ARTICLE ON "METASTATIC THYROID TUMOR
IN THE ORBIT"

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FIG. 1

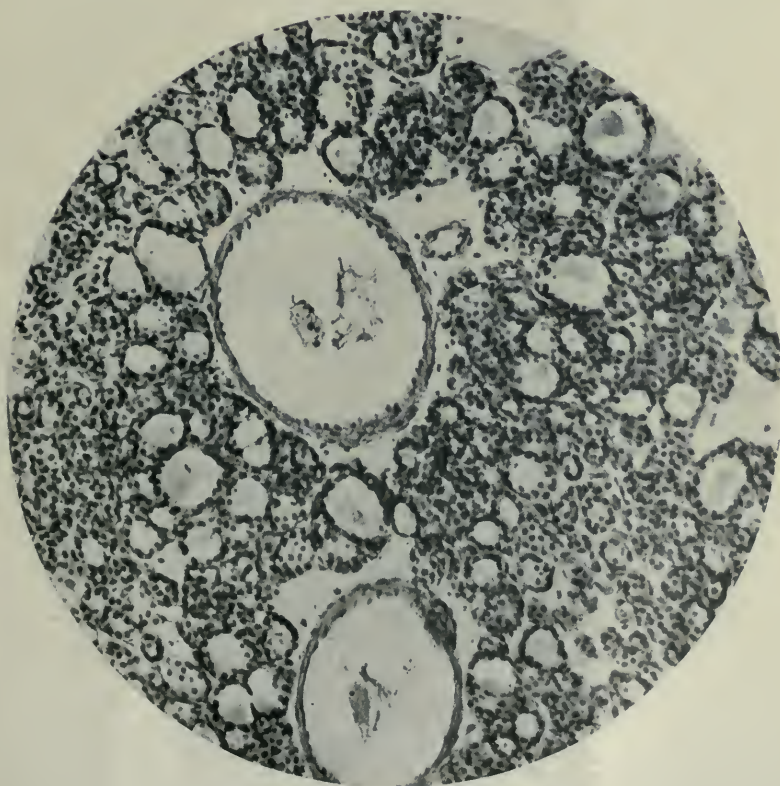


FIG. 2

fist to an egg. The age of the patient is between 30 and 60. It affects women more frequently than men. Trauma was elicited in 11. From the standpoint of the histology of the tumor and the clinical course, the struma metastases were malignant in 39, uncertain in 5, possibly benign in 5.

The following is an instance of this form of tumor:

CASE REPORT.—E. R. B., age 66, Dec. 18, 1917: Has always been in good health until recently. Has complained of vertigo and comes on account of discomfort in reading. Vision with glasses $\frac{3}{8}$. Both eyes seem unduly prominent. The right upper lid droops and the right eye is distinctly more prominent than the left. Exophthalmometer R. 32, L. 28. The motility of the right eye upwards is restricted, particularly in abduction (superior rectus). Distinct vertical diplopia, increasing upwards and to the right. This diplopia patient has observed for one week. On palpating the right upper orbital margin, there is a resistance to be felt, especially in the region of the pulley, which consists of a soft mass within the upper margin of orbit, occupying a round defect in the bone, where pulsation can be felt. The pulley is displaced. Optic nerve normal. Field normal. His physician Dr. Edward L. Partridge reports that the general examination is negative. The blood count is normal; hemoglobin 90%. The Wassermann test is negative.

The *Roentgen* examination shows (figure 1) an area of increased radiability on the right side, indicating an area of softening. It involves the orbital plate of the frontal and extends above the superciliary ridge. It is about three quarters of an inch in its widest diameter. It extends about one inch above the supra-orbital ridge and along the orbital plate to the sphenoidal fissure. There seems to be no involvement of the frontal sinus, but there is a supraorbital extension of the ethmoidal cells which seems to be very near indeed to this area of softening. With the exception mentioned, we find no indication of disease of any of the accessory nasal sinuses. The skull is unusually thick, especially the outer table of the frontal bone (H. M. Imboden).

Increasing doses of potassium iodide are prescribed for six weeks without any change in the tumor. An operation is advised.

Feb. 19th, '18, *operation*. Curved incision below the eyebrow down to the periosteum, which was found continuous downward with a mass. Incision made through the periosteum and the attempt was made to elevate it. It was so

firmly adherent to the underlying structure that this failed. The center of the mass seemed to be soft. The incision through the periosteum was then enlarged and immediately a dark hemorrhagic-like mass resembling granulation tissue presented. The area was fully exposed, some of the periosteum removed and the above-described material was scooped out. The cavity was found in the bone extending back, upward anteriorly and laterally. Profuse bleeding which made it difficult to see and one had to be guided by a sense of touch. After cleaning out all this soft material and some the rough bone along the margins, a rather well-defined cavity was exposed. The constant oozing was somewhat controlled by packing; it could then be seen that in two small places in the upper wall, the dura was exposed without being directly involved. The edges of the bony cavity were trimmed off and the entire cavity packed with iodoform gauze. The external wound was left open. Length of operation 1 hour.

In brief, this seemed to be a tumor arising in the medulla of the bone, particularly in the anterior part of the frontal, where it forms the upper wall of the orbit. The cavity was filled with soft, dark-red material. This in the lower part was directly adherent to the periosteum. A striking feature was the extensive bleeding which seemed to be general. The bony walls of the cavity were smooth.

No reaction followed the operation. At the first dressing some of the packing was removed; considerable oozing.

The specimen removed at operation was sent to Professor James Ewing, who reported as follows:

"The tumor (figure 2) of the bone in the case of E. R. B. proves to be an adenoma of aberrant thyroid tissue. It is rather orderly in structure and not very malignant, although in some spots the alveoli are small and numerous. It reproduces thyroid structure to the smallest detail, many alveoli containing soft acidophile colloid surrounded by flat thyroid cells. Many small alveoli are exactly similar to the usual thyroid adenoma. The stroma is scanty and not vascular.

"This tumor may arise from a portion of thyroid tissue originally present at that point in the embryo, or it may represent a metastasis of an adenoma in the thyroid. The thyroid gland should be examined for the presence of any small tumor at any point. I am inclined to prefer the

former hypothesis, especially if there is no tumor found in the thyroid.

"The prognosis of these cases is not entirely favorable. Although they have been called 'benign metastasizing struma' they are not always benign. They recur locally, and the only other case in the skull which I have seen (Jeffries' case, in parietal bone) recurred locally and eventually produced metastases elsewhere. The thyroid was normal. Hence I recommend that radium be inserted in the wound, as the alveoli penetrate the bone spaces and are hard to reach by the knife. I know of no cases treated by radium, but would expect this structure to respond well."

Feb. 24th, all of the packing is removed and a radium tube 27mc protected by a lead plate is introduced for four hours. The thyroid gland seems normal. Mar. 1st, no reaction, slight secretion superficially; wound is allowed to close.

April 1, '18. The wound healed. A swelling remained at the upper margin of the orbit continuous with a bony mass externally just above the external canthus. Some exophthalmos remains measuring R.30, L.28. Vision is normal. Eye ground normal.

Nov. 26, '18, general condition good: no change in orbit.

Apr. 8, '19, has lost about 30 lbs. in weight; complains of band over head and obscure abdominal symptoms.

July 1st, R.31.5, L.28. Diffuse swelling in orbit. Vision and eyeground normal.

Oct. 8th, drawing sensation in right half of head. R.32, L.28.

Dec. 19th, the orbital condition is unchanged. Diplopia to the right. Distinct soft pulsating mass in orbit. A swelling had been noted over right scapula for some months and patient complains of neuralgia in right groin.

On Dec. 29, '19, the patient is referred to Professor James Ewing, at the General Memorial Hospital who reports as follows:

"There is a tumor mass behind the eye which causes distinct exophthalmos and protrusion of the supraorbital tissues of about 1cm. The body of the right scapula is largely replaced by a tumor mass about 5cm in diameter, as shown by the X-ray. This tumor is of recent discovery and evidently grow-

ing actively. The left lower portion of the thyroid gland is the seat of a well circumscribed rather firm tumor mass about 4cm in diameter. There is pain in the use of the right thigh muscles, which was not investigated, but will receive attention later. The X-ray of the right lung shows several suspicious isolated nodules, which I suspect are tumor nodules, but which cannot be positively identified as such. Further X-ray photos of the lungs and bones will be taken. The patient has lost weight, is anemic and rather feeble, and is therefore distinctly cachectic. I feel that the prognosis is unfavorable, but that some help may come from X-ray and radium treatment.

"I would recommend that the tumor of the scapula be treated by X-ray, that the orbital growth be treated at first by a radium pack, and that the thyroid tumor be treated by the insertion of radium needles. This latter tumor is probably the source of the others. The scapular growth was treated this afternoon. We propose to go after the others slowly, but steadily, avoiding undue disturbance of the patient."

The shoulder tumor was given eleven X-ray treatments from Dec. 29, 1919, to May 18, 1920. A radiograph on Jan. 7, 1920, showed a destructive process in the VIIIth rib posteriorly and an area of bone destruction in pubis to right of symphysis. On Jan. 20, 1920, a small area of destruction was found in the VIth rib posteriorly. The right groin was treated by X-ray four times from Jan. 6 to May 4, 1920. Radiograph on Jan. 7, 1920, showed dense shadow above manubrium and, to the left of about the size of a small orange, indicating the presence of a calcified mass in the thyroid gland, pushing the trachea over to the right.

The orbit was treated with radium three times from Jan. 19, 1921, to Apr. 27, 1921.

The patient, according to Dr. R. W. Lowe, Ridgefield, Conn., then gradually lost weight, suffered from hallucinations and delusions, and was at times mildly maniacal. There was flatness over anterior and posterior chest (left); pleuritic pain, loss of motion over chest, dyspnoea, slight cough. Lymphatic enlargement in neck (left side). Edema of lower extremities, increasing during last two weeks. Died July 21, '21, apparently from cerebral hemorrhage.

In this patient a tumor in the roof of the orbit was the first

symptom of a malignant process. At operation destruction of bone by a brownish granulating tissue-like mass was found present and unusually free hemorrhage occurred. The histology of the tumor showed it to be composed of thyroid gland tissue. No tumor could be detected in the thyroid gland on palpation. Symptoms of other metastases appeared one and a half years later and were confirmed by the X-ray examination in the scapula, in the VIth and VIIIth ribs, in the lungs and in the pubis, and at that time a distinct tumor was discovered in the thyroid gland, and the X-ray showed that it extended behind the sternum.

The localization of these thyroid gland tumors in the walls of the orbit is unusual. In the literature there is a report of a case by v. Eiselsberg (Langenbeck's *Archiv*, vol. xlv., p. 440) of a woman 37 years old who showed externally a bulging nodule in the substance of the parietal bone, projecting inward and adherent to dura. Another nodule was situated in the right upper orbital wall extending through into the skull. The VIth rib right and the left humerus were also involved; struma present (adeno-carcinoma) autopsy report.

Jaboulay's patient (*Bull. Soc. de chirurgie de Lyon*, 1903), a female, 65 years old, presented a tumor in the superointernal angle of the left orbit, pulsating; old swelling of the thyroid gland. At operation the bone was found perforated, exposing the meninges.

In the discussion of v. Eiselsberg's report (*Verh. d.d.G. Chir.* 1893, p. 88 i.), Kraske said that he had observed a case where a tumor occurred in the frontal bone, the patient also having a struma. The association at first was not clear. At operation an unusual hemorrhage occurred, which is characteristic for this tumor. The tumor was adherent to the dura, necessitating excision of a part of this structure. The struma has remained stationary and no other metastases appeared. Microscopically the tumor resembled thyroid gland tissue and was regarded as an adenoma.

According to v. Eiselsberg (*ibid.*, p. 255, ii.), though the histological structure of the tumor suggested adenoma, the clinical picture is that of an adeno-carcinoma, because whenever a tumor metastasises, it becomes malignant.

The metastases of the adeno-carcinoma of the thyroid may

show normal thyroid adenomatous tissue. The metastases grow slowly, while the primary tumor in the thyroid is small and escapes detection. The bone metastases should be operated upon, v. Eiselsberg believes, though it is a general rule in surgery not to operate on bone metastases.

The primary tumor in the thyroid is often not found until the character of the metastases is made known.

BASAL CELL CARCINOMA OF THE ORBIT AND ETHMOID: OPERATION; RADIUM APPLI- CATION.¹

BY DR. JOHN GREEN, JR., ST. LOUIS, MO.

CARCINOMA of the orbit by direct extension from primary malignant growths in the lacrimal glands, lids, and skin is not very rare, and a number of cases have been recorded in the literature. Much less frequent are cases of orbital carcinoma where metastasis has occurred through the blood-stream from a primary focus distant from the orbit. Finnoff² in a recent study was able to find only seventeen authentic examples of metastatic carcinoma of the orbit.

The case herewith presented belongs to the category of orbital carcinoma by direct extension. It is deemed worthy of record for the following reasons: (1) it presented an ophthalmological and surgical dilemma; (2) it illustrated a remote danger from the application of radium; (3) the procedure adopted, entirely justifiable from the strictly surgical standpoint, proved disastrous to the eye.

CASE REPORT.—Mrs. M. T., age 53, came under my observation July 22, 1920, complaining of protusion of the left eye.

General History: One sister died of tuberculosis; mother dead (cause unknown, but she had tuberculous glands). No malignancy in the family.

The patient's general health has always been good. Has had measles, pertussis, pneumonia (3 years ago), rheumatism (?). Every spring and fall since the age of sixteen she has had a "breaking out" called erysipelas by some of her medical advisers. Is often dizzy and has smothering

¹ Read before the American Ophthalmological Society, May 1, 1922.

² Finnoff, Wm. C., *Trans. Am. Ophthalm. Society*, 1920.

spells. Three weeks ago had a left upper molar extracted, followed by chills and fever. Menopause four years ago. Two of four children are living.

General Examination.—The patient appears in fair health. Weight 131½; T. normal; pulse 88; heart, lungs, and abdomen normal. There is a slight oedema of the feet. Urinalysis, negative, except for epithelial cells and a few bacteria. B.P. 122-72. Hemoglobin 80%, clotting time 2½ minutes. Wassermann, negative.

Ocular History.—Fifteen years ago she noticed a swelling of the skin over the bridge of the nose. The physician first consulted called it "lupus." His treatment failing, the patient consulted an irregular practitioner who diagnosed "cancer" and applied pastes. The lesion eventually healed (but only superficially as events proved).

Seven years ago she observed a small hard nodule at the left lower orbital margin. This increased in size very slowly for five years, but hardly at all during the past two years. There has been some aching and soreness behind the left eye. The protusion of the left globe was observed about five years ago.

Ocular Examination.—Right eye, highly myopic (over 20 D,—retinoscope). Staphyloma posticum. R.V., fingers at 1 meter (excentric). L.V. + .5 = $\frac{5}{8}$. L. Eye ground, normal.

There is a hard rounded growth 1cm in diameter, about the middle of the lower orbital margin. Just mesially is another smaller rounded nodule. On the bridge of the nose, just below the level of the eyebrows, is a typical "paste" scar which extends a few mm toward the left inner angle. There is, however, an island of normal skin between the scar and the caruncle.

The patient was referred to a rhinologist, Dr. C. F. Pffingsten, who reported that there was a slight bulging of the left lateral wall of the nose, and that the septum was deviated to the left. An X-ray picture (frontal) failed to disclose any abnormal condition in the orbit but did show a mottled or moth-eaten appearance of the left antrum. On puncturing the antral wall the trocar encountered firm (bony) resistance a few mm within the antral cavity. Provisional diagnosis: osteo-sarcoma of the antrum with secondary involvement of the orbit. The patient was referred to Dr. Ellis Fischel for surgical consultation.

In view of the uselessness of the right eye, it was difficult to decide whether any operation on the left orbit was justifiable, especially as the orbital growth had produced only slight exophthalmus (Exophthalmometer—R., 15½; L. 17) and there was no severe pain. It seemed to Dr. Fischel and

myself that an incision along the lower orbital border to permit the removal of a fragment of the nodule for microscopic examination was justifiable and would not imperil the globe. If a malignant orbital growth was found, it was decided to implant radium needles.

A detailed explanation of the surgical and ophthalmological quandary was made to the patient and she finally decided to submit to operation. This was performed August 4, 1920, by Dr. Ellis Fischel, to whom I am indebted for the following notes:

"A $1\frac{1}{4}$ inch" incision along the infraorbital ridge was carried down to the bone. The tumor mass in the floor of the orbit proved to be very thin bone, which had been broken through by a soft tumor growing below it. Small section of tumor, adherent to bone, reported (frozen section) "basal cell epithelioma." It was now judged that we were dealing with a very slow-growing malignant tumor, the original site of which was the bridge of the nose. In view of the clinical evidence and operative findings so far the antrum must be involved. One-half inch of the old scar on the bridge of the nose was deeply excised in order to substantiate the hypothesis of the origin of the trouble. Beneath this scar extensive tumor infiltration was found. The nasal process of the frontal bone was apparently infiltrated. The left antrum was widely opened through the canine fossa and a thorough digital and instrumental examination failed to discover any disease. A rounded bony mass covered by smooth mucous membrane projected from the mesial and superior walls of the antrum. This was judged to be an enlarged ethmoid cell. It was punctured and tumor masses similar to those in the orbit were removed by the curette. $62\frac{1}{2}$ mgm of radium in 5mm silver and 1mm rubber was placed in the ethmoid cavity; $12\frac{1}{2}$ mgm radium in gold needle was inserted into the tumor tissue in the wound in the orbit; two $12\frac{1}{2}$ mgm radium in gold needles were placed deeply in tumor tissue through the incision over the bridge of the nose. The skin incision was closed with six interrupted horse hair sutures. Rubber drain in orbit. Antrum packed loosely with iodoform gauze. Patient left the table in good condition.

The excised tissue from the bridge of the nose and the masses curetted from the ethmoid cells were submitted to a pathologist, Dr. George Ives, who reported typical basal cell carcinoma.

The radium needle was removed from the orbital wound at the end of eight hours = 100mgm hours. The needles in the nose and ethmoid were removed in 15 hours, a total of $1312\frac{1}{2}$ mgm hours.

The patient had a severe general reaction, the temperature reaching 104° on the second post-operative day, accompanied by delirium. The temperature did not reach normal until the tenth post-operative day. August 10th; free purulent discharge from wound of orbit and much swelling over the left antrum. This diminished after insertion of gauze drain. August 13th; there is much oedema of the eyelids. The eye can be inspected and, save for conjunctival congestion, looks normal. Mobility impaired downward. Accurate visual test impossible, but patient counts fingers at 12 ft. Ophthalmoscope, media clear; fundus normal. August 14th; the patient was permitted to return to her home in the country, and placed in the care of the family physician. Nothing more was heard of her until August 28th, when her physician telephoned that she was very ill with erysipelas. December 4th, the patient's husband wrote that his wife could not see out of her left eye, that the eye "seemed to be lost."

She did not appear in St. Louis until January 28, 1921. She stated that following the attack of erysipelas there was infection and discharge, and pieces of bone came out. Now complains of pain in the left superior maxilla and discharge into the nose and mouth. There is considerable oedema of the lids. Left eye, phthisis bulbi. V. = O. Below inner canthus is a smooth opening into the antrum which contains loose sequestra. There is another opening in the canine fossa. February 3, 1921; a large sequestrum in the ethmoid region was removed. The orbito-antral opening continues to discharge sequestra. The patient's weight has dropped to 114. There is no evidence of tumor tissue anywhere.

She was instructed to return in six weeks but failed to do so. A letter (March 18, 1922) to her physician elicited the simple statement that she was "better."

The sequence of pathological events seems reasonably clear. A malignant growth originating in the skin over the bridge of the nose healed superficially, but tumor cells infiltrated the nasal process of the frontal bone and finally involved the ethmoid. It is reasonable to suppose that the orbit was involved from the ethmoid cells, although the possibility of subcutaneous extension directly from the site of the original lesion on the bridge of the nose may also be considered.

Was the radium implanted in the orbit directly responsible for the loss of the eye? I believe that one can safely answer this question in the negative. The total *mgm* hours of all the

radium implantation amounted to 1412½ of which only 100 *mgm* hours were used in the orbit. It is well known that the cornea and sclera are particularly resistant to radium emanations. In the treatment of cancers of the lid much heavier doses have been given without screening (300*mgm* hours or more) without damage to the globe, although lashes have been lost and conjunctivitis, with œdema of the lids, has ensued. In the treatment of malignant growths of the antrum a dosage as high as 2400*mgm* hours has been given without detriment to the eye.

There can be no question that the radium implanted in the orbit led to destruction of tumor tissue, leaving an open wound which became infected. At the time the patient left the hospital this infection was well under control. Later a severe type of infection, probably streptococcal, led to necrosis of bone, erosion of the sclera, perforation of the globe, and phthisis bulbi.

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A CASE OF EPIBULBAR MELANOTIC SARCOMA, OCCURRING SIXTEEN YEARS AFTER AN INJURY.

BY DRs. JAMES MOORES BALL AND HARVEY D. LAMB, OF
ST. LOUIS.

(With two illustrations on Text-Plate II.)

EPIBULBAR pigmented sarcomata, situated at the limbus, are of such rarity as to justify this report. Mr. J. G. Clegg and Dr. I. W. Hall, of Manchester, England (*The Lancet*, Sept. 10, 1904), say:

"Holmes found three cases during the examination of 20,000 eye cases; Noyes observed three melanotic sarcomata amongst 70,000 eye patients; Adamück mentions the occurrence of similar pigmented growths in three out of 16,000 eye cases; Verhoeff and Loring report two such tumors which were met with during the routine examination of 44,719 eye patients, while amongst the 520,523 out-patients who have attended at the Manchester Royal Eye Hospital during the last 33 years, three cases of pure melanotic sarcoma of the limbus have been recorded, although general 'orbital melanosis' has been frequently noted."

The case to be described is the first undoubted one (*i.e.*, verified by microscopic examination) of its kind which the writers have observed.

Mr. R. B., aged 33 years, a farmer, was brought to Dr. Ball by Dr. W. J. Whitefort, of St. Elmo, Ill., on April 19, 1921.

About sixteen years ago Mr. B.'s left eye was struck by an iceball. Following the injury there remained a brown spot situated on the temporal side of the sclera. This spot did not disappear. It remained small and gave no trouble until

ILLUSTRATING DR. JAMES MOORES BALL'S AND DR. HARVEY D. LAMB'S
ARTICLE ON "A CASE OF EPIBULBAR MELANOTIC SARCOMA
OCCURRING SIXTEEN YEARS AFTER AN INJURY."

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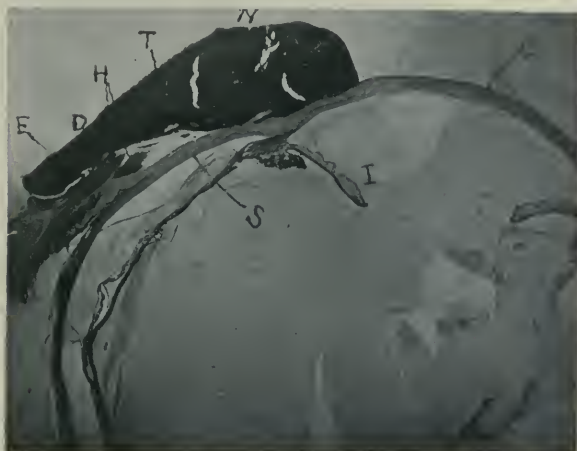


FIG. 1.—Epibulbar Melanosarcoma with Adjoining Portion of Eyeball. Magnified 5 x.

C—Cornea; S—Sclera; I—Iris; E—External rectus muscle; N—Neoplasm; D—Darker-staining tip; H—Hemorrhage; T—Cellular infiltration.

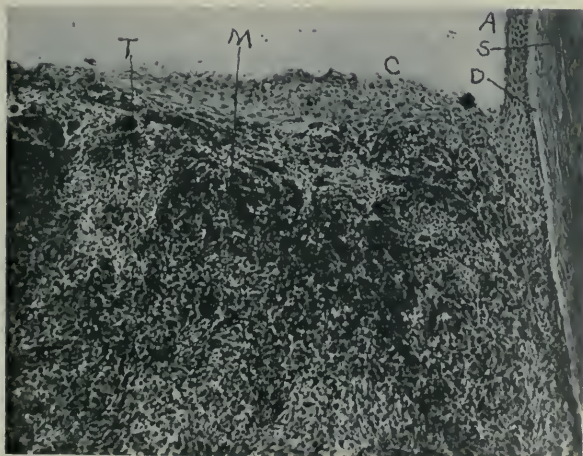


FIG. 2.—Epibulbar Melanosarcoma with Adjoining Portion of Cornea. Magnified 100 x.

A—Anterior epithelium of cornea; D—Bowman's membrane; S—Substantia propria of cornea; C—Covering epithelium of growth; T—Round cells of sarcoma; M—Pigmented portion of the growth.

six months ago, when it began to enlarge and to grow rapidly.

Six weeks ago the growth was cut from the globe by Dr. C. A. Higinbottom, of Vandalia, Ill. Removal was followed by immediate recurrence, until now the new mass is as large as was the one removed. Occupying the corneo-scleral region on the temporal side of the left eye is a dark-brown, elastic mass measuring from 9 to 12 millimetres vertically; from 13.5 to 16mm horizontally; and reaching a height of 6mm.

Vision of R.E. $\frac{3}{8}$; of L.E. $\frac{3}{8}$. The fundi are normal.

Diagnosis.—Epibulbar Melanotic Sarcoma.

(Patient refused to permit the removal of a small piece of the tumor for microscopic examination.)

Treatment.—On April 20, 1921, the eye was enucleated. Up to date (July 1, 1922), there has not been any sign of recurrence.

Pathologic Report.—(Dr. H. D. Lamb). One-half the eyeball with its growth was fixed in formalin, imbedded in celloidin, and the sections were stained with hemotoxylin and eosin.

On section (Fig. 1) at its middle the growth is seen to extend about three times as far onto the sclera as on the cornea. Thickest at or just behind the limbus, the tumor as we follow it forward onto the cornea diminishes but little in thickness, while posteriorly, the thickness becomes uniformly and rapidly less.

The tissue of the growth is seen to be stained quite uniformly bluish and is quite sharply differentiated from the adjoining red staining cornea and sclera.

Microscopic Findings.—The ocular tissues, with the exception of the growth itself, and the immediate adjoining structures, show no apparent changes.

The tumor-mass (Fig. 1) while it lies directly in apposition to the cornea and to the sclera just behind the limbus on which it lies, posteriorly leaves the sclera, being separated from it by some very loose connective tissue. The posterior tip of the growth lies free, separated on its underside from the eye-ball by epithelium which is continuous with that of the bulbar conjunctiva.

Surface views of the sections (Fig. 2) show nuclei in great profusion, mingled with which there is a moderate amount of dark-brown pigment. Strands of connective tissue can be made out in many places; at the corneal end of the tumor there is much connective tissue in thick strands, but in the remaining five-sixths of the section-length it occurs in very fine bands along which in many places clumps of pigment

are grouped. Indeed, in many places these pigmented connective tissue lines form a well-marked alveolar arrangement.

The nuclei of the tumor cells are quite large, round or oval-shaped. They stain generally rather faintly and show a distinct nucleolus. In most places no intercellular tissue can be made out. The pigment is very irregularly arranged, occurring in amounts from the thinnest particles to large opaque clumps. It is in the cells, between them, but for the most part along the band of connective tissue. Blood-vessels are very scarce in the tumor, except at the ends of the growth and in the parts adjoining the sclera. The posterior fourth of the neoplasm (Fig. 1) is strangely different from the adjoining anterior portion. There is a rather sharp line of demarcation, the posterior part appearing considerably bluer in color, due, of course, to the nuclei there taking the hemotoxylin stain better. There is very little pigment present in this posterior portion, while immediately anterior beyond the line of demarcation there is considerable pigment. What is the explanation for this appearance?

The covering epithelium (Fig. 2), continuous with the anterior corneal epithelium, is of a varying thickness changing gradually from three or four layers to as many as ten or twelve layers of cells. This tumor epithelium is chiefly distinguished from the corneal epithelium (Fig. 2) in being made up of layers of flattened epithelium for about three-fourths of its thickness. There are, however, no keratinized layers present.

The effect of the growth upon the immediate adjoining structures is surprisingly little. There is a small amount of infiltration of mostly polymorphonuclear leucocytes, but also some large lymphocytes, between the corneal lamellæ beneath the growth. In several places these are well marked, appearing as thin linear infiltrations. There is no epithelium between the growth and the cornea, but Bowman's membrane (Fig. 2) is absolutely intact throughout its length, and no sarcoma cells can be seen interior to it. Beyond the end of Bowman's membrane posteriorly, there is a gradual thickening of the cornea and sclera (Fig. 1), which reaches its highest point just opposite the thickest part of the ciliary muscle. This thickening is due to new lamellæ of connective tissue formed on the outer part of the sclera, no doubt as a protective measure against the tumor. On the margin of the tumor, adjoining the sclera, there is a rather general infiltration with polymorphonuclear leucocytes and large lymphocytes. This infiltration is well-marked about the vessels and on the inner edge of the growth; just after it has left the proximity of

the sclera the infiltration becomes intense for a few millimetres, and extends quite a distance outward among the sarcoma-cells. There is also considerable cellular infiltration in the epithelium of the bulbar conjunctiva beneath the posterior tip of the neoplasm.

REMARKS.

While most epibulbar melanotic sarcomata have been met with in late middle or advanced life, at least three cases have been observed in children aged 8, 11, and 14 years respectively.

As ætiologic factors traumatism, irritation, and congenital ocular melanosis have been mentioned. The important question as regards epibulbar sarcomata concerns their degree of malignancy. Early removal of the growth, with cauterization of the affected area, may suffice to effect a cure. The patient should be warned, however, of the possibility of a recurrence, and should be kept under observation for a prolonged period.

The question of malignancy in epibulbar sarcomata was studied by Verhoeff and Loring (*ARCHIVES OF OPHTHALMOLOGY*, March, 1903). In their analysis of 73 cases they state that in 53 cases, in which primary abscission was done, recurrence followed in 36 of the patients; the growth reappearing within one year in 10, within two years in 3, and in the remainder within a period of six to ten years or more. Metastatic nodules were observed in 7 cases, while in 5 others nodules also appeared in the orbit or on the lids. Of 19 cases in which primary enucleation was performed, the interior of the eye was involved in 3 cases, while in 3 other cases there were general metastases in the internal organs.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

BY MR. H. DICKINSON, LONDON.

The first meeting of the Session was held on October 13th, the new President, Mr. A. L. WHITEHEAD (of Leeds), occupying the Chair.

Cases.

Dr. RAYNER BATTEN showed a man with **calcareous degeneration and a deposit on the iris**. When two years of age the right eye was injured, and the lens appeared to have been absorbed.

Dr. J. A. VALENTINE showed a case of *cyst of the retina*, the patient being a woman 26 years of age. She had never been out of Portsmouth. Eighteen months ago she noticed a line moving in front of the right eye. She was found to have 2D. myopic astigmatism, and the axis was down and out 15° . At first he thought of the possibility of it being cysticercus, but no confirmation of that view could be obtained.

Mr. TREACHER COLLINS agreed with the diagnosis, and commented on the rarity with which such was seen ophthalmoscopically, though the discovery was common in pathological specimens. One such case he saw, and it was regarded as gliomatous and the eye excised, the actual condition being revealed afterwards.

Mr. VALENTINE, in reply, said one member expressed to him the view that it might be tuberculous disease of the choroid, and that was supported by there being a similar shaped white area two disks distance lower down.

Mr. WILLIAMSON-NOBLE showed a patient with **angioid**

streaks in the retina. The only positive result in the investigation of the case was that the patient's complement-fixation reaction to tubercle was positive.

He also exhibited and demonstrated a plane glass retinoscope, for use without a mydriatic. It consisted of two tubes, placed at an angle of 30° ; and where these joined a piece of plane glass was placed, mounted on screws to allow of adjustment. At the far end of the tube was a 30-candle power light. Projecting from the casing was a tube containing a 20D. convex lens. A stop was placed between the lamp and the lens, and another stop beyond the lens. The glass was so arranged that a beam of light was projected down the center of the tube, at one end of which the patient was seated. Refractions could be easily determined by it, especially low degrees of astigmatism.

THE PRESIDENT considered the instrument a very ingenious one, and there were great possibilities before it, particularly when further improvements suggested had been incorporated.

The President's Address.

Mr. WHITEHEAD then delivered his Presidential Address. After expressing his warm appreciation of the high honor accorded to him, he referred to the recognition of the speciality by his Majesty in conferring knighthoods on Sir John Parsons and Sir Richard Cruise. He had a sympathetic word for the loss by death of Edward Stack, of Bristol, and Charles Wray, of Croydon.

He devoted his address to a consideration of the subject of ocular tuberculosis. Tuberculosis was more frequent in Leeds and less frequent in the West Riding of Yorkshire than in England and Wales as a whole. England and Wales as a whole had a tuberculosis case-rate of 2.07, the lowest since 1914; that for the West Riding was 1.61. The case-rate for Leeds was 2.61. Tubercular lesions of the eye were very rare in pulmonary tuberculosis, but if cases of ocular tuberculosis were followed up it was often found that other manifestations were present. In 1921 Igersheimer and Prinz published a paper giving the results of following up 92 scrofulous eye cases for 10 to 30 years. In 13.9% there were changes in the lungs,

and 13% had symptoms of active tuberculosis. Mr. Whitehead considered there was an important difference between the severe spreading invasions of the eye, leading to more or less complete destruction of the eyeball, and the more chronic and benign forms of tuberculous infiltration: in the former typical giant cells and tubercle bacilli were frequently found, but in the latter there was usually failure to demonstrate them. In these it was believed the infection was due to a tuberculo-toxin acting on a specially prepared area. Miliary tubercles of the choroid in acute tuberculosis of infants were frequently present: in most of the fatal cases of tubercular meningitis he had examined he had found miliary tubercles. These tubercles occurred in the same class of individuals as those having the less severe forms of tuberculous infection of the eye. They were a third to half the size of the optic disk, grayish-yellow, with a soft indefinite margin; later the circular clean-cut edges of the atrophic patch were very characteristic. Usually they were not recognized until a later age when vision is interfered with.

He had not seen primary tubercle of the retina, but he had one case of what he regarded as a nodule in the papilla of tuberculous nature. Degenerative changes in vessels followed by hemorrhages, sometimes into the vitreous, had been described, and he had experience of two cases in which vitreous hemorrhages preceded other evidences of general tubercular infection, and in those patients pulmonary tuberculosis occurred 12 to 18 months after the appearance of the hemorrhages. Possibly some of the unexplained cases of recurrent vitreous hemorrhage might be due to toxin infection from a tuberculous focus elsewhere in the body. Schieck especially had reported favorably on the use of tuberculin in recurrent retinal hemorrhages.

Dealing with tubercular iritis, he said that in many of the milder cases of this condition the nodules were small, they disappeared early, and left but little permanent change in the iris structure. The subjects were usually young and apparently robust females, with no other evidence of tuberculosis, but with a family history of susceptibility to the infection. In these cases tuberculin treatment, in proper dosage, had been frequently of value. Hessberg considered that more than half

of all cases of iritis were attributable to tuberculosis. Phthisis and joint tuberculosis seldom co-existed, but frequently the lymphatic glands of mesentery and mediastinum were affected. In the view of most ophthalmologists the percentage given by Hessberg was much too high. Involvement of the lacrimal sac by the disease did not seem to be common, but he had seen it secondary to polypus of the nose and as an extension of tubercle of the ethmoid. An epiphora might develop secondary to nasal tuberculosis; in one such case it followed tuberculous ulceration of the inferior turbinate. This patient, a girl of 12, also had tuberculous ulceration of the vulva, which was cured by local and general treatment. A year later her toe was amputated for tubercular dactylitis, and then the nose and lacrimal sac were affected, and later still the pharynx and larynx. During the five years these successive lesions had been developing the child had maintained a very healthy look.

In tubercular conjunctivitis the large sub-epithelial nodules leading to ulceration and large granulations were rare.

With regard to the possible tubercular origin of the common phlyctenular conjunctivitis of children, Veeder and Hempelmann reported, in 1920, 196 cases of phlyctenular disease, and 93 of them gave a positive von Pirquet reaction. In half the cases, tuberculous lesions were found in other organs, and of those kept under observation for a year or more, four-fifths gave evidence of other tuberculous processes. The President had noticed a type of phlyctenular conjunctivitis which he had come to regard as definitely tubercular. Occurring mostly in young adults, it was a very chronic type, and resistant to ordinary treatment. The phlyctenules were small and closely set, near the corneoscleral junction, and there was frequently infiltration of the cornea, with invading vessels. Ulceration was very rare. Iritis was sometimes present also. In all the cases there were evidences of tubercular process elsewhere or there was a family history of susceptibility to the disease. Examination of the tissue and inoculation gave negative results. Immediate and striking benefit followed the use of tuberculin in these cases. Tuberculin B.E. was used, and the initial dose was 1.5,000mg to 1.10,000mg, according to age.

Four-hourly temperature records were taken for 24 hours with the patient in bed. Failing a general reaction or temperature, an increased dose was given three days later. When the reaction was obtained the dose was repeated, and if there was again a reaction, the dose short of this was given, and repeated at weekly or fortnightly intervals, according to the case. He had not had any experience of direct local applications of various dilutions of tuberculin P.T.O. (bovine). Constitutional treatment was of great importance, as also was the searching for and treating any local focus of the disease.

With regard to the possibility of the mediastinal glands being the primary focus in cases of toxin infection of the eye, Professor Stewart had supplied him with some important observations. In 100 cases of death from rapidly-fatal war injuries on men of good physique, there was evidence of tubercular disease in 42%, in 11% scarring at the apices of the lungs, and in 1% extensive old pleuritic adhesions. In 32 of the 100 there were signs of glandular infection; hence it seemed the primary focus in these cases of tuberculo-toxin might be the bronchial and other glands. Excision of the affected conjunctiva in some cases was tried, but without specially satisfactory results. The best results seemed to follow if a strip of conjunctiva 2 or 3mm in width were excised all round the corneo-scleral junction, and the larger superficial vessels involving the cornea carefully scarified by the point of a Graefe knife. The value of peritomy had been emphasized by several ophthalmic surgeons, and he believed it to be one of the most valuable aids extant.

Tubercular keratitis following infection after injury he regarded as rare, as also was secondary infection from the conjunctiva, the ciliary body, or the iris. In his experience, peritomy was of the greatest value in the treatment of the pannus of tubercular keratitis, though it was valueless in congenital syphilitic keratitis; but the possibility of a mixed infection must always be remembered.

Mr. N. BISHOP HARMAN read a paper entitled "Standards of Vision for Scholars and Teachers in Council Schools." He said the teacher's life was, in his view, a hard one, and short

hours and good holidays did not ensure against risk of strain to normal eyes. This risk was increased in cases having an ocular defect. The teacher's work, of course, was not limited to the energy expended in the class-room, as there was much preparation to be carried out. In schools worthy the name there was also a large social element, the organization of which fell to the teachers in State schools, for here there were no officials such as prefects.

The State had provided an "Educational ladder," rungs of which were scholarships, college, university training. It was a necessary corollary of this provision that the recipient of these advantages should have the physique to enable him or her to benefit by them. The absence of such physique meant wastage, and the physical failures probably kept out better candidates. There were tests of vision in existence, but there was a real need for these tests to be standardized. Otherwise a teacher trained in one area might be refused in another, an undesirable anomaly. Trained teachers should be freely interchangeable, as they would with a uniform standard, and this free movement engendered breadth of view and added experience.

Junior scholarships were awarded at the age of 11 years, and provided for five years at a secondary school. Senior scholarships were awarded at 16 years of age, and gave four years at a University. The training college was entered at the age of 16, and teachers were admitted to their work at 21.

Recently the author had adduced evidence of the disability due to defective vision in myopes. It was found in that investigation that myopes of 3D. to 5D. who were engaged in continuous close work showed failure in work to the extent of 33%; those from 5D. to 10D. to the extent of 60%, and those over 10D. to 77%. The whole of these myopes showed a failure of 53%; whereas myopes of the same order who did not engage in continuous close work failed only to the extent of 9.4%. On this basis, the author had worked out a table of standards, which he now submitted to the Section for consideration and discussion. Starting with the allowable margin of error in teachers at the age of 21, the difference was estimated for the children at the age of 11.

TABLE OF STANDARDS

(a) Hypermetropia

<i>Candidates</i>	<i>Age</i>	<i>Sphere</i>	<i>Cylinder</i>	<i>Sphero-cylinder</i>
All	11-21	5D.	4D.	Average of four meridians = 5; as. not over 3D., e.g., + 3.5D. sph. c. + 3D. cyl.

(b) Myopia, with Mixed Astigmatism.

Teacherships	21	5D.	4D.	As in hypermetropia
Senior Scholars	16	4D.	3D.	Average of four meridians = 4. As. not over 3D., e.g., - 3D. sph. c. - 2D. cyl.
Junior Scholars	11	3D.	3D.	Average = 3D., As. 2D., e.g. - 2D. sph. c. - 2D. cyl.

Mr. Harman had given consideration to a number of possible defects due to odd eyes, old inflammations resulting in scarred eyes, etc., also amblyopia from squint and defects of color vision.

Difficulty might sometimes arise in the disbaring of young myopes who were alleged by their teachers to be "brilliant," but these reports should not be considered too seriously. Myopes devoted an undue amount of time to close work because the defect of sight presented a handicap in games, yet the all-round candidate with better sight might be the better in the long-run. The 2D. difference between teacher and junior scholar in the allowable degree of myopia was none too much for ten years of hard study between the 11th and the 21st years, which were also the most critical years of development. In such cases it was better, in the interests of both the candidates and the teaching service, to divert their energies to safer channels at an early age. There were now trade scholarships, entailing but little strain on the eyes.

Mr. ERNEST CLARKE agreed that lamentable mistakes had arisen through various County Authorities having different standards of vision and fitness for their candidates. It would be a difficult matter to devise a standard of universal application; one child with more than 3D. of myopia might be puny

and narrow-chested, with no liking for games, while another, with a like degree, might be robust and one who indulged in out-of-door games. Much must hinge on the previous personal history, and there should be records kept of each child, so that the examiner would know whether the myopia was progressive. And it would be extraordinarily difficult to set a standard for hypermetropia; in those cases it was the small errors of astigmatism which would count, because those with big errors would take care of themselves. Some people seemed to be born teachers, and it seemed a pity to exclude them from that profession. Much must depend upon supply and demand; if many candidates were available, the standard could be kept high, but if the converse were the case, it would have to be lowered.

Mr. INGLIS POLLOCK spoke of the methods in use at Glasgow. If a child was found to have increasing myopia, it was open for the examiner to admit him, but with the proviso that he could not participate in the Superannuation scheme.

Mr. T. HARRISON BUTLER pleaded for discretion to be vested in the examiner. To express an opinion on a case of myopia in this connection, one should see the child for two years. Myopic children had a natural tendency towards learning, and he contended that progressive myopia had no connection with following near work. It would be undesirable to allow an unproved theory to influence legislation.

Dr. F. C. SHRUBSALL spoke from the standpoint of the school medical officer. He welcomed such a contribution as Mr. Harman's if it led to a general consensus of opinion, as sometimes the opinion given by the school medical officer was overridden by a letter from a specialist. Candidates should be told of their unsuitability before commencing the study, not after studying four years.

In the end, the subject was referred to the Council of British Ophthalmologists, with a request that they would try to devise an uniform standard.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

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(Concluded from November number.)

XI.—THE LENS.

72. ALBRIGHT, G. C. Subconjunctival dislocation of the crystalline lens. *American Journal of Ophthalmology*, August, 1921.

73. CRIDLAND, B. The occurrence of glass-workers' cataract in puddlers (iron-smelters). *British Journal of Ophthalmology*, May, 1921.

74. FISCHER, M. A. A case of cataract formation in consequence of starvation oedema. *Med. Klin.*, 1920, p. 924.

75. GREEN, A. S., and LUNA, R. P. The Barraquer intracapsular cataract operation. *American Journal of Ophthalmology*, August, 1921.

76. HEALY, J. The prevalence of lenticular opacities in the eyes of tin-plate millmen. *British Journal of Ophthalmology*, May, 1921.

77. PARKER, W. R. Senile cataract extraction. *American Journal of Ophthalmology*, September, 1921.

78. ROBERTS, B. H. ST. CLAIR. A series of cases of glass-blowers cataract occurring in chain-makers. *British Journal of Ophthalmology*, May, 1921.

79. VAN DUYSE, D., AND DANIS, M. Typical siderosis of crystalline lens. No clinical evidence of a splinter of iron. *American Journal of Ophthalmology*, August, 1921.

80. ZIEGLER, S. L. Complete dissection of the lens by the V-shaped method. *Journal of the A. M. A.*, October 1, 1921.

ALBRIGHT (72, Subconjunctival dislocation of the crystalline lens) reports the case of an elderly lady, who as a result of traumatism had a dislocated cataractous lens under the conjunctiva. After four years, as the result of a slight injury, the lens was extruded through the conjunctiva and remained in the fornix until removed ten days later. ALLING.

Much attention of late years has been given to industrial disease. Many pathological states have been found to be due directly to the conditions under which certain trades are carried on. Miners' nystagmus and glass-blowers' cataract are now recognized under the Workman's Compensation Act of Great Britain.

It has long been suspected that other occupations, in which the men are exposed to molten substances, may cause cataract and should be included in the Act.

In the May number of the *British Journal of Ophthalmology* there are three papers describing lenticular changes, similar in appearance to those occurring in "glass-blowers," which have been found in iron-smelters, tin-plate millmen, and chain-makers.

Taking the papers in order: CRIDLAND (73, **The occurrence of glass-workers' cataract in puddlers**) describes the occurrence of typical glass-blowers-cataract in iron-smelters. The condition is not common, only 2-3 cases being seen a year, but "puddling" does not require many men and steel is coming more and more into use in place of "puddled" iron. The appearance of the cataract in "puddlers" is identical with that seen in glass-blowers, namely: a round posterior cortical opacity.

HEALY (76, **Lenticular opacities in the eyes of tin-plate millmen**) deals with lenticular opacities in tin plate millmen. Healy's attention was first drawn to this condition by the number of cases of cataract occurring in tin-plate workers, the men themselves being under the impression that cataract is very rife amongst themselves, and in the second place by the fact that clinically the lens changes in these men appeared very similar to those occurring in glass-blowers.

Particular points regarding the work of these men are that they work in 8 hour shifts, that they are continually exposed to molten metal at a distance varying from 2 to 5 feet from the eyes, that the work is heavy and the heat great so that the men perspire freely and in consequence drink a great deal, usually beer or tea, that the men are not square to their work so that the eyes are unequally exposed, and that the ultra-violet rays in tin-plate mills are negligible. From the statistics reported it appears that it takes upwards of 15 years in this occupation to produce the lens changes.

Of the men examined:

Group 35-40 years	16.5 per cent. affected
Group 40-45 years	18 per cent. affected
Group 45-50 years	34 per cent. affected
Group 51-55 years	62 per cent. affected
Group 56-60 years	64 per cent. affected

The usual age at which this work is taken up and the eyes become exposed is 18-20 years.

The character of the opacity differed from that seen in glass-blowers inasmuch as the commonest appearance was a wedge shaped striated cortical opacity below with its apex upwards and growing into the posterior cortex. This was by far the commonest appearance and was seen in 50 per cent. of the cases. The next most common appearance however was the round posterior cortical opacity, similar to that in glass-blowers. This occurred in 10 per cent. of the cases. In some cases both forms occurred together.

Healy is of the opinion from his own experience and from the statements of the workmen that the cataract is of very slow growth.

In reviewing the clinical facts which he has produced, Healy contends that the incidence of cataract among tin-plate workers is definitely raised as compared with the normal incidence.

It has been debated as to whether the ultra-violet or the infra-red rays are the causative agent of glass-blowers' cataract and it has been more generally held that it is the infra-red rays which are to blame; but against this view it was advanced that no record of cataract amongst iron workers had been produced. Healy's figures supply this deficiency.

Regarding the pathology of this condition Healy suggests that:

1. The heat rays cause at first an increased growth of lens fibers and later an exhaustion of this process at the time when sclerosis and shrinking of the nucleus is occurring.

2. The effect of the heat rays on the iris and ciliary body and the resulting aqueous and so on the nutrition of the lens.

ROBERTS (78, *Glass-blowers' cataract in chain-makers*) reports and describes a series of cases of "glass-blowers' cataract" occurring in chain-makers.

Chain is made by hand. The rolled iron rod is heated and bent into the shape of a link; the two ends in apposition are then heated to a white heat and welded together to complete the link by being hammered on an anvil.

The workers are therefore looking either at the furnace or at the white hot metal for the whole of their working day.

The usual age of onset is between 40-50 years, so that, as in the tin-plate workers, it takes 15-20 years to produce the condition.

In all cases the opacity was a posterior polar and cortical one but in some of the cases there was also a small anterior cortical opacity.

P. G. DOYNE.

The paper of GREEN and LUNA (75, **The Barraquer intracapsular cataract operation**) records the impressions of a visit to the clinic of Professor Barraquer. The latest device consists of a special electric motor which creates a vacuum in the small cup which adheres to the lens and at the same time transmits fine vibrations which are thought to assist in the rupture of the zonula. The operation is still in the experimental stage but it seems likely to become extensively employed.

ALLING.

FISCHER (74, **Cataract formation in consequence of starvation œdema**) reports the case of an iron worker 31 years old in whom bilateral cataracts formed within three months. This was in March, 1920. In April, 1919, he had suffered from starvation, with emaciation, bradycardia, polyuria, and œdema varying in degree. There were no signs of tetany. The urine contained no albumin, sugar, or indican. His occupation as a iron worker seemed to have no connection with the formation of cataract. In the absence of all signs of disease of the eyeball, general disease, or metabolic disturbances, and in the absence of demonstrable disturbances of the endocrine glands, the author thinks the starvation œdema must be looked upon as the cause of the formation of cataract.

PARKER (77, **Senile cataract extraction**) reports on 1421 cataract extractions in private practice and in the clinic of the University of Michigan during the last sixteen years. There were 1013 combined, 156 simple, 49 Knapp, 91 Indian, 141 after preliminary iridectomy, and 8 after trephine for glaucoma.

Loss of vitreous occurred in 10.1%, the Indian operation giving the greatest percentage. Infection is recorded as 0.7%. There were three cases of expulsive hemorrhage and 3% of post-operative delirium. The author's experience with the Indian operation has led him to the conclusion that it is not as safe as the older methods.

ALLING.

The eye described by VAN DUYSE and DANIS (79, **Siderosis of lens with no other evidence of a splinter of iron**) was injured, about two years before the examination, by a piece of steel. The lens was cataractous and showed nine yellowish-brown spots in the anterior cortex just under the anterior capsule. There were also numerous fine dots of russet color. Small pigment corpuscles of darker color were scattered on the anterior capsule. These may have been congenital or due to blood pigment. The supposition is that a small piece of steel penetrated the eye at the limbus, leaving no wound when passing through the periphery of the iris and lodged in the lens. In time it became oxidized and disintegrated so that the X-ray, sideroscope, and magnet gave negative results.

ALLING.

ZIEGLER (80, **Complete discission of the lens by the V-shaped method**) in operating for cataracts, plunges his needle directly through the lens into the vitreous, using his method for discission of the capsule by making two incisions in a V-shape. He believes that the danger of glaucoma from the too rapid swelling of the lens substance is prevented because the pressure on the iris angle is relieved through the opening in the posterior capsule. Only one operation is necessary and the absorption goes on with much greater rapidity than with the usual procedure, being usually complete within a month.

ALLING.

XII.—GLAUCOMA.

81. GOERG. The results of Elliot's operation for glaucoma. *Diss. Giessen*, 1920.

82. HEINE. Operative treatment of glaucoma. *Klin. Monatsbl. f. Augenheilkunde*, lkv., p. 2.

83. LEHMANN. Acute poisoning with atropine after instillation in a case of glaucoma simplex. *Ibid.*, lkv., p. 112.

84. STIEREN, E. Glaucoma after cataract extraction. *American Journal of Ophthalmology*, June, 1921.

GOERG (81, **Results of Elliot's operation**) gives the results in 22 cases of trephining, part of which had been under observation only a few weeks. Three cases were of hemorrhagic glaucoma; in one there was improvement of vision, in one the eye had to be enucleated on account of severe pain, in one the lens became opaque. In two cases of chronic glaucoma the vision improved, in two it remained the same, in three it became worse, in five the tension was reduced to normal. In three cases of simple glaucoma the vision was made worse, in two it was permanently improved, and in two there was a temporary improvement. No important effect was obtained in two cases of absolute glaucoma. One case of secondary glaucoma was temporarily improved. Subsequent complications were: Increase of lenticular opacities, usually preëxisting, in five cases; detachment of the retina in one; sympathetic inflammation in two; atrophy of the eyeball in two; late infections in three.

STIEREN (84, **Glaucoma after cataract extraction**) reports three cases, in two of which he did a trephine operation in order to relieve the tension. He believes these cases to be rare and explains the increased tension by supposing that the vitreous closes the spaces of Fontana although in some instances the condition is due to epithelial ingrowth which sometimes lines the whole anterior chamber. ALLING.

HEINE (82, **Operative treatment of glaucoma**) thinks trephining the most dangerous of all interventions for glaucoma. The object of an operation is to secure the most perfect result possible by the slightest possible and least dangerous procedure. In acute glaucoma this is usually attained by iridectomy, and trephining is superfluous. Cyclodialysis may be employed in case of recurrence. In over a thousand cyclodialyses he has never seen an infection. The indication is not simply to reduce the tension, but to preserve the functions of the eye in their widest sense, vision, field, color sense, and light sense. If loss of function cannot be prevented by miotics, operation is necessary. Cyclodialysis is far less dangerous than iridectomy or trephining, because of the absence of danger of injury by the operation itself, and because of the absence of the danger of late infection. In simple glaucoma it is superior to iridectomy, and in prodromal stages it should be tried first.

LEHMANN (83, **Acute poisoning with atropine after instillation in a case of simple glaucoma**) reports the case of a man 47 years old who had been under treatment with pilocarpine and eserine a number of years for glaucoma and was suddenly seized with convulsions, parietic symptoms, and loss of consciousness. The pupils were moderately dilated and immobile, a condition which led to the suspicion that atropine had been substituted in his eye drops. This was found to be the fact. For four days he had instilled atropine three times a day instead of pilocarpine. The first attack appeared shortly after the first instillation. The tension of the eye had risen from 20mm to 60mm. This rise persisted for a week after the drug had been changed back, and reduction was not complete until the end of the third week.

XIII.—RETINA AND OPTIC NERVE.

85. BLAGVAD and RÖNNE. **Retrobulbar neuritis.** *Klin. Monatsbl. f. Augenheilkunde*, August-September, 1920, p. 206.

86. BRUNER, A. B. **Spasm of the central retinal artery.** *American Journal of Ophthalmology*, July, 1921.

87. CLAUSEN. **Angiomatosis retinae.** *Klin. Monatsbl. f. Augenheilkunde*, August-September, 1920, p. 413.

88. DEUTSCHMANN, R. **A peculiar, probably congenital macular change.** *Archiv f. Ophthalmologie*, cii., p. 1.

89. ERGGELET. **Angiomatosis retinae.** *Klin. Monatsbl. f. Augenheilkunde*, August-September, 1920.

90. GILBERT. **Anatomy of changes in the myopic fundus.** *Archiv f. Augenheilkunde*, lxxxvi., p. 282.

91. GOURFEIN-WELT. **The relation of retinitis exudativa to angiomatosis retinae.** *Klin. Monatsbl. f. Augenheilkunde*, July, 1920, p. 105.

92. GRISCOM, J. M. **Hereditary optic atrophy.** *American Journal of Ophthalmology*, May, 1921.

93. GUIST. **Angioid streaks.** *Zeitschr. f. Augenheilk.*, xlv., p. 217.

94. LAMB, R. S. **Treatment of detached retina,** *American Journal of Ophthalmology*, September, 1921.

95. MEINSHAUSEN. **Pathological condition in a fresh case of embolism of the central artery of the retina.** *Klin. Monatsbl. f. Augenheilkunde*, August-September, 1920, p. 199.

96. MELLER. **Relation of retrobulbar neuritis to the nasal cavity ætiologically and therapeutically.** *Zeitschr. f. Augenheilk.*, xlv., p. 191.

97. SMITH, HENRY. **Night blindness.** *Journal A. M. A.*, October 1, 1921.

BRUNER (86, **Spasm of the central retinal artery**) describes the case of a man, aged 34, who came to him suffering from

attacks of blindness in the left eye which began suddenly and lasted for a few minutes and then gradually disappeared. The attacks occurred as often as ten times a day. During an attack the fundus showed the nerve and retina decidedly pale, arteries markedly contracted and the veins with the blood current stopped and broken into short columns. After about two weeks the patient had no further trouble.

ALLING.

MEINSHAUSEN'S (95, **Pathological condition in a fresh case of embolus of the central artery of the retina**) patient died three days after the embolism occurred. Autopsy revealed thrombi in the right ventricle, an open foramen ovale, and infarcts in the lungs, kidneys, and retina. Degenerative changes were present in the inner layers of the retina, distinct in the internal granular layer, of less degree in the layer of ganglion cells. The principal changes, oedematous, were seated in the fifth or intermediate granular layer, which is supplied by the choriocapillaris. This isolated oedema came from the choriocapillaris, and so is explainable as a collateral oedema in spite of the complete occlusion of the central artery. The engorgement found in the posterior choroidal vessels, with a simultaneous accumulation of leucocytes, is considered a collateral hyperæmia with accompanying chemotaxis.

CLAUSEN (87, **Angiomatosis retinae**) describes the ophthalmoscopic picture seen in a woman 39 years old with typical angiomatosis retinae. At one place was an exudation into the retina as in Coats' disease. A plexus of blood vessels lay on top of the exudation, and about the margins were proliferations of glia.

ERGGELET (89, **Angiomatosis retinae**) reports a bilateral case. The X-rays were unable to check the advance. Iridectomy was performed in one eye on account of glaucoma. The other eye, in which cataract and painful glaucomatous condition had developed, was enucleated. The expected vascularity of the nodules in the retina was not present, the picture rather resembled that of exudative retinitis.

GOURFEIN-WELT (91, **Relation of retinitis exudativa to angiomatosis retinae**) gives the findings in an eye enucleated from a boy 16 years old on account of hemorrhages and irido-

cyclitis. Prior to enucleation the ophthalmoscopic picture was typical of Coats' exudative retinitis. In the region of the macula of the other eye was a small red spot which was connected with a little looped vessel. The enucleated eye contained an angioma. The writer thinks that in most cases Coats' disease is the final state of an angiomatosis.

GILBERT (90, **Anatomy of changes in the myopic fundus**) describes his findings in eight myopic eyes. He mentions ruptures of the choroid into which the retina had been drawn and was either adherent, or incarcerated like a hernia. The choroid was infiltrated in the neighborhood of these places. As regards the formation of conus, he says that he found the folds of nerve fibers described by Heine three times, but doubts their importance in the genesis of conus, which he thinks is more probably due to an atrophy of the choroid.

In a woman 45 years old GUIST (93, **Angioid streaks**) found in each macula a retinitic spot with crescentic atrophies of the choroid temporally from the papilla. In both eyes were broad, brown pigment stripes arranged in a radiating manner; between these were finer superficial stripes, some branching, some punctate. In red free light these stripes looked gray, showing that they were not hemorrhages as these look black in red free light. In the same light the retina presented the usual greenish reflex with here and there a radiating direction of fibers. Over the pigment striæ this uniform green shimmer was as if teased out; the fiber structure was vertical to the pigment stripes. The pigment ring usually found about the papilla was absent. This recalls the case like this reported by Pagenstecher in which Koehne found 17 years later that a circumpapillary ring had developed.

DEUTSCHMANN (88, **Peculiar change in the macula**) has observed a peculiar change in the macula in four cases, bilateral in one, monolateral in three. In the macula was a blue or a white spot surrounded by a red zone, which in turn was surrounded by whitish, atrophic spots separated by pigment radii, so that the entire figure resembled a wheel. Although the possibility of an interuterine inflammation was not excluded, Deutschmann thinks the condition due to a developmental fault as other developmental faults were present.

LAMB (94, **Treatment of detached retina**) by his treatment

tries to change the character of the fluid coming through the eye to remove if possible the fluid behind the detachment and to increase the intraocular tension that the retina might be held in place if reattached. To accomplish these objects the Murphy drip containing 10 grams of sodium carbonate and 20 grams of sodium chloride was employed, secondly, cyanide of Hg was injected subconjunctivally and thirdly, the thyroid extract was used until symptoms of over secretion appeared. He relates three cases in which the results seemed to be moderately satisfactory.

ALLING.

SMITH (97, Night blindness) says that idiopathic night blindness is common in India, the disease being generally called retinitis pigmentosa but without pigment. He has rarely seen the pigmented variety in India. The atrophy slowly and steadily progressed until the patient is blind. The field of vision contracts *pari passu* with the advance of the disease. The reaction of the pupil also becomes progressively sluggish. Bearing these facts in mind the detection of malingering is easy.

ALLING.

GRISCOM (92, Hereditary optic atrophy) reports fourteen cases in three generations of a family of thirty-three individuals. Aside from the optic atrophy the most constant feature was a low grade retinal degeneration. He believes that the family suffered from toxemia perhaps due to some type of perverted secretion.

ALLING.

BLAGVAD and RÖNNE (85, Retrobulbar neuritis) discuss three forms of this affection, diabetes amblyopia, tobacco-alcohol amblyopia, and Leber's hereditary neuritis. Common characteristics of these are the almost constant bilaterality, and the overwhelming preponderance of occurrence among men rather than women. An accurate differential diagnosis must be made between Leber's disease and tobacco-alcohol amblyopia. Idiopathic cases, in which heredity is not demonstrable, prove to belong to this group through the stationary condition and through the much greater impairment of vision. A tabulated comparison of the idiopathic cases with those known to be hereditary shows a marked uniformity as regards age and severity of the visual disturbance which contrasts with the amblyopia induced by tobacco and alcohol. Leber's

disease is most apt to occur in the third decade of life, tobacco-alcohol amblyopia in the fifth and sixth decades; in the former disease vision is reduced to counting fingers at 3m up to $\frac{6}{80}$, in the latter usually to about $\frac{6}{24}$. In Denmark during the war a marked change appeared in the tobacco-alcohol amblyopia, the highest frequency appeared in the fourth and fifth decades of life, and the vision was usually reduced to counting fingers at 3m. The cause appears to lie in the prohibition of spirituous liquors and the drinking of substitutes, including denatured spirits. Investigation has shown that the addition of fusel oil is productive of a much greater toxic effect.

MELLER (96, **Relation of retrobulbar neuritis to the nasal cavity**) deals only with those affections of the eye in which scotoma is the only ocular symptom. If the therapeutic evacuation of an empyema of the ethmoid is successful, the importance of the accessory sinus disease is not to be denied even though multiple sclerosis should appear later. Markbreiter found changes in the visual fields in seventy per cent. of all such empyemata, hence it is not the papillomacular bundle alone which is affected. When there is no empyema and the ætiology is obscure, there should be no hesitation about intervening in the nose, because attention to disease of the mucous membrane, or enlargements of the turbinates, may be of unquestionable benefit. A good primary result followed by deterioration, with the nasal condition negative, does not necessarily prove that the cause was not rhinogenous; the transient improvement in such cases may have been due to the exclusion of certain circulatory and toxic troubles, while the changes in the papillomacular bundle may have gone too far and so result in final destruction.

XIV.—INJURIES AND FOREIGN BODIES.

98. ALEXANDER. Bilateral rupture of the sclera. *Münch. med. Wochenschr.*, xxxv., p. 1027.

99. LANDOLT, M. Self-inflicted eye injuries. *American Journal of Ophthalmology*, May, 1921.

100. PATTON, J. M. Foreign body impacted in the sclera and retina loosened under direct observation with ophthalmoscope and removed. *Ibid.*, June, 1921.

101. VOGT. Prolapse of the vitreous into the anterior chamber after contusion. *Klin. Monatsbl. f. Augenheilkunde*, July, 1920, p. 102.

ALEXANDER (98, **Bilateral rupture of the sclera**) reports a curious case, met with in a demented woman. One eye had been gored by a cow, and yet had a normal fundus and good vision with a correcting glass. The sclera of her other eye had been ruptured subconjunctivally by a blow, and, after absorption of the resultant hemorrhages, retained good vision.

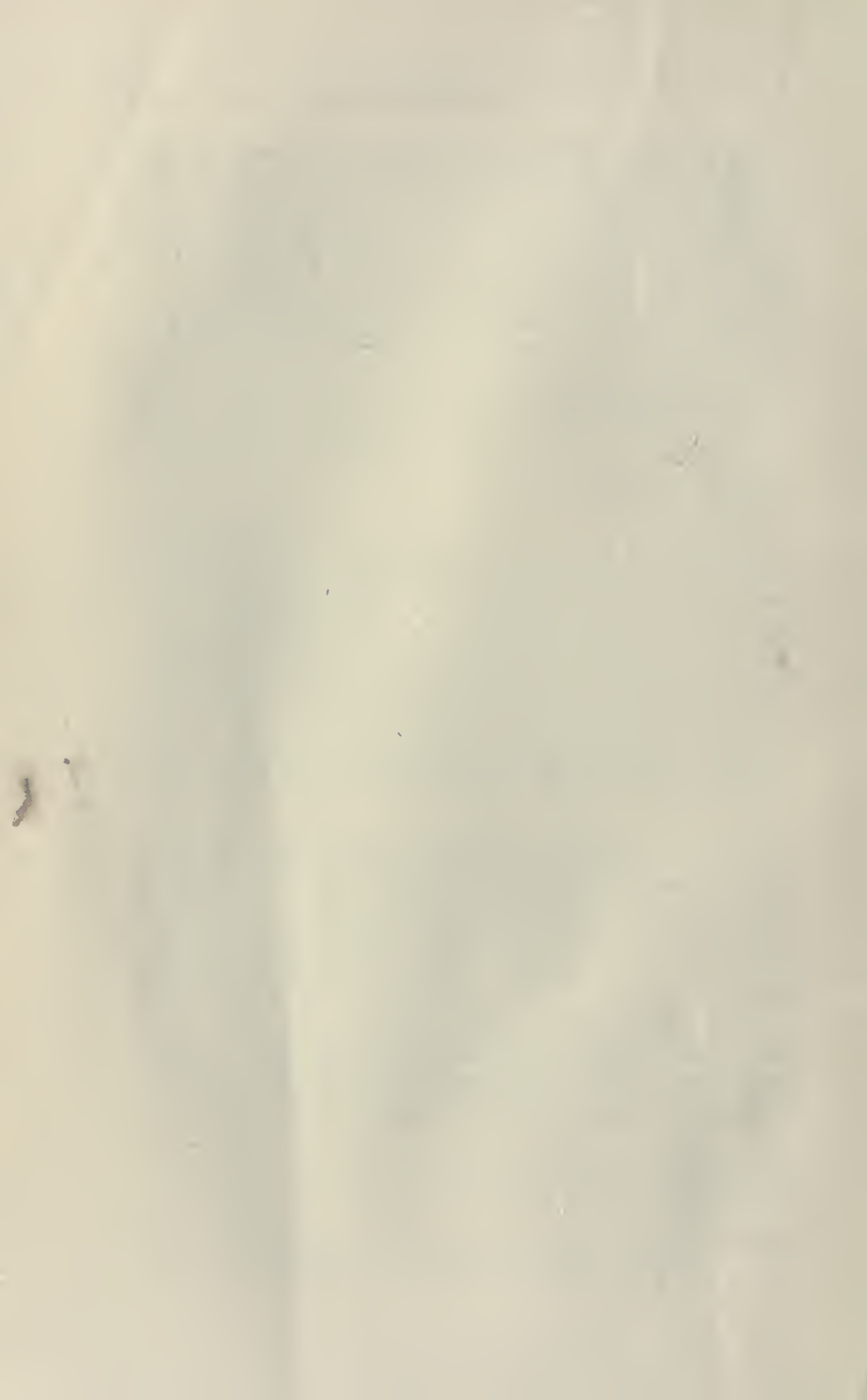
LANDOLT (99, **Self-inflicted eye injuries**) after referring to the literature of traumatic conjunctivitis produced by the application of such irritants as soap, tobacco ash, and castor bean, recites the case of a young man, who, in order to escape military service on two different occasions, punctured the sclera in the ciliary region with a penknife. Both wounds healed without trouble.

ALLING.

PATTON (100, **Foreign body in the sclera and retina loosened under direct observation and removed**) discovered a piece of steel a short distance from the nerve-head imbedded in the retina in a patient who had been injured about three months before. After repeated attempts to extract it with the magnet, he introduced a knife needle and dislodged the steel while viewing the fundus with an ophthalmoscope. The splinter was then easily brought into the anterior chamber and then removed. He knows of but one similar successful case reported by Haab.

ALLING.

VOGT (101, **Prolapse of the vitreous into the anterior chamber after contusion**) reports two cases in which the lens and iris remained in their normal positions and there were only slight lacerations of the sphincter. Where the prolapse entered the anterior chamber the iris was lifted up a little from the anterior capsule. In the prolapse could be seen blood, which became absorbed more slowly than a hemorrhage into the anterior chamber, and some stains of pigment. A hyaloid membrane could be detected only through the difference of index. There was no increase of tension in either case.



ARCHIVES OF OPHTHALMOLOGY.

STUDIES IN THE VIRUS OF HERPES SIMPLEX.¹

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(*With eight illustrations on Text-Plates III.-IV.*)

INTRODUCTION.

THE subject of the aetiology of herpetic lesions is one that has, until recent years, been severely neglected by scientific investigators. As is usually the case when intensive study brings forth many new and important facts in a field that has long lain fallow, much of the recent discussion has been confused and encumbered by an inadequate and overlapping terminology. We shall, therefore, segregate from out of the mass of conditions clinically described as herpetic, two distinct groups of lesions *herpes zoster* and *herpes simplex*, and confine our discussion to them.

Of these two the former has long been recognized as a clinical entity. Epidemiological and clinical evidence recently gathered would tend to show that many, or perhaps all cases

¹ Read before the Harvard Medical Society, Boston, Mass., December 19, 1922. This work was undertaken at the suggestion, and conducted under the guidance of Dr. F. H. Verhoeff to whom the author is gratefully indebted.

of herpes zoster were due to an infection with a specific organism, and that this organism is closely allied to the causative agent of chicken-pox. In ever increasing numbers epidemics of chicken-pox are being reported in which the spread of the epidemic seems, with reasonable certainty, to have been traced to a case of herpes zoster as source. Cases of herpes zoster apparently contracted by contact with cases of chicken-pox have also, though less frequently, been reported. On the other hand, certain observers have noted as the result of careful general examination of patients suffering with herpes zoster, the frequent presence of isolated vesicular and pustular lesions scattered over the patient's body outside of the region involved in the zoster, and they describe these lesions as being in every way similar to those of chicken-pox. (Bibl. 1-9.) Experimental evidence is as yet lacking for the proof of this theory that herpes zoster and chicken-pox are both manifestations of infection with one and the same organism, but the infectiousness of herpes zoster has been demonstrated by Lipschuetz (39), who has produced herpes-like lesions in rabbits by inoculation with serum obtained from the vesicles of herpes zoster. This observation is, as yet, unconfirmed.

Herpes zoster is, then, a well defined clinical entity, but whether it is an infectious disease due to a single specific organism, while strongly suggested, has as yet not been proven conclusively. In the case of herpes simplex the opposite is true. Under this term we wish to embrace a considerable variety of clinical forms which we hope to show are produced by a single specific infectious organism. We propose to include under this head those cases of herpes occurring in the course of various febrile diseases and also labial or facial, genital, or corneal herpes, in general, excluding only herpes zoster. From the experimental side there seems to be no good reason for distinctions within this group.¹ Whether, as would seem likely, herpetic stomatitis also belongs to this group, has not as yet been proven, nor is it known whether or not herpetic lesions of this kind occur on the various internal mucous membranes. It is to the consideration of the ætiology of herpes simplex and not of herpes zoster that the rest of this paper will be confined.

¹ Exception should perhaps be made for genital herpes, see below.

Simple herpes and the corresponding forms of herpetic keratitis have generally been regarded as symptoms rather than as a specific disease entity, symptoms that might be produced by any one of a number of different ætiological agents. The frequent occurrence of herpes in various infectious diseases such as pneumonia, epidemic meningitis, malaria, multiple sclerosis, and infectious jaundice, as well as in many mild gripe-like infections, is well known. So also is the occurrence of herpes after intravenous and arsenical therapy, during menstruation, after dietary indiscretions, and even, as sometimes alleged, after emotional stress. It would seem difficult to assign any specific ætiology to a condition which occurs under such a wide variety of circumstances, but it should be remembered that herpes occurs perhaps most frequently as an isolated phenomenon, or at best associated with mild gripe-like symptoms,—congestion of the upper respiratory tract, slight general malaise, moderate psychic depression, and perhaps even a low fever. This last condition has sometimes been called "herpetic fever."

Though the theory of the symptomatic nature of herpes has gained general acceptance, not a few articles can be found in the literature disputing this notion, most notably those articles reporting epidemics of herpes simplex or herpetic fever. To cite only the most recent of such reports,—K. Mayer (10) describes an epidemic which broke out in an isolated company of troops. The company consisted of about 70 men, 6 officers. All men slept in one large room, the officers in one small room. The first case of herpes appeared among the officers. In the course of two weeks, 5 out of the 6 officers and about 30 of the men became affected. The appearance of the lesions was quite typical of ordinary herpes. Most of those affected complained of mild malaise but none was so ill as to be unable to perform his duties. The epidemic reached its height at the beginning of the second week and died out at the end of two weeks. No other disease was concurrently present in epidemic form. Zlocisti (11) has described a similar epidemic and reports in detail the clinical course of his cases, some of which were unusually severe. The existence of epidemics of this kind would naturally lead to the supposition that herpes is not merely a symptom but a specific infection. It is interesting, in this

connection, to note that there is a belief widely held among the laity that labial herpes is contagious. Popular beliefs of this kind are often based on sound though uncontrolled observation and deserve more respect than is generally accorded them by the profession.

HISTORICAL.

In the past few years a great wealth of experimental evidence has been brought forward tending to show that all the various forms of simple herpes are manifestations of infection with one single specific organism. In 1912-13, Grüter (35) found it possible to produce in rabbits a violent keratitis by inoculating their corneæ with scrapings from the lesions in a case of dendritic keratitis. It was possible, furthermore, to transmit this condition from one rabbit to another by successive inoculations. These observations were confirmed by Kraupa (37)

Loewenstein (40), and later Luger and Lauda (41) repeated Grüter's experiment and demonstrated further that an identical form of keratitis could be produced in rabbits by inoculation with material derived from any form of herpes simplex or herpes febrilis, either corneal, facial, or genital; *not*, however, from any form of herpes zoster. The technique of these inoculations was very simple. The herpetic bleb was cleaned off with alcohol and then incised with a sharp knife. This knife with the drop of serum clinging to it was immediately used to scarify in linear streaks, the cornea of a rabbit previously anæsthetized with cocaine. Later it was found that inoculation could also be successfully made if the contents of the herpetic bleb were suspended in salt solution and a knife dipped in this suspension was used to scarify the rabbit's cornea,—indeed the virus was found to be potent in amazingly high dilutions. The clinical course of the disease so produced in rabbits will be discussed below. These writers have noted that it bears many points of resemblance to dendritic and superficial punctate keratitis. By the aid of the immunity which is established in animals that have recovered from the disease they demonstrated the identity of the noxious agents which they had obtained from a great variety of herpetic

lesions.¹ Control experiments of simple scarification of the rabbit's cornea, and also inoculations from normal labial epithelium, from burn blisters, eczema pustules, etc., failed to produce the disease.

Loewenstein, and Luger and Lauda were able to transmit this disease from one rabbit to another with undiminished virulence. Guinea pigs were slightly susceptible, cats and dogs could not be infected. They found that the noxious agent obtained from the herpetic bleb or the infected animals' cornea could be rapidly destroyed by heat, less rapidly by cold, that it could not be preserved for 24 hours in salt solution nor in serum at incubator temperature. They were unable to demonstrate conclusively the presence of any visible micro-organisms, though Loewenstein described certain minute dots in stained smears from herpetic vesicles. He concluded that the organism belongs to the group of ultramicroscopic or filtrable viruses, and Luger and Lauda later succeeded in passing the virus through a Berkefeld filter. From their experiments these writers were convinced that they were dealing with a specific virus found only and always in herpetic lesions and causing herpes-like manifestations in experimental animals.

These authors reported, also, that certain of the infected animals developed symptoms of a severe general disease with paralyse and convulsions, often terminating in death. One cannot fail to note a strong analogy between this last observation and the findings of Levaditi and Harvier (18) who, working with a virus obtained from a case of epidemic encephalitis (lethargica) were able to produce in rabbits by corneal inoculation a keratitis followed by convulsions, paralyse, and death. Two questions now arose. *First*—is the fatal disease which

¹ Loewenstein failed to demonstrate the identity of facial and genital herpes in his immune experiments, and Lipschuetz was unable to infect guinea pigs with his strains of the virus obtained from genital herpes though these animals are at times susceptible to infection with the virus of facial herpes. The force of this argument is somewhat weakened by the fact that different strains of herpes virus vary greatly in their virulence for both rabbits and guinea pigs. Cushing (29) has reported a case in which facial and genital herpes developed simultaneously after operation on the gasserian ganglion.

occurs, at times, in rabbits whose corneæ have been inoculated with the virus of herpes due to that same virus or is it due to a secondary infection? *Second*—does any relation exist between the virus of herpes and the virus of encephalitis described by Loewe and Strauss (19), Levaditi and Harvier (18), and others? Both these questions have been answered in the affirmative.

Doerr and Vochting (30), and Doerr and Schnabel (31), and later others found that rabbits inoculated intracranially with herpes material regularly developed paralyses, convulsions, and died, and that this disease could be propagated from one rabbit to another by inoculating the second intracranially with an emulsion of the brain of the first, and that, further, after the virus had undergone several passages from brain to brain, it could be transferred to the cornea of a healthy rabbit and produce there a typical herpetic keratitis. Furthermore, animals which had recovered from a keratitis were immune to such intracranial inoculations. The two diseases are, therefore, caused by the same virus. The virus could be recovered also from the brains of animals that developed "encephalitis" after corneal inoculation.

Doerr and his co-workers next recovered a virus, from a case of epidemic encephalitis, which they found to be in every way identical with their herpes virus even to the establishment of complete cross immunity between the two. Blanc and Canninopetros (27), and Levaditi, Harvier, and Nicolau (38) were unable to confirm this last observation. They found that the virus of encephalitis with which they were working had consistently a greater virulence than the herpes virus, and that while animals which had been rendered immune to the encephalitis virus were immune also to herpes the converse was not true.

Levaditi, Harvier, and Nicolau discovered also a third virus, present in the saliva of 80% of normal persons, which partook of the common characteristics of the virus of encephalitis and that of herpes, but which was less virulent than either of these. This virus they named "virus salivaire keratogène." They were able also, with any of these three strains, to produce skin lesions in rabbits having all the characteristics of herpetic skin lesions in man. They group these three viruses together with

those of rabies, polyomyelitis, and certain of the exanthems under the heading "ectodermotropic" since they all exhibit a marked selective affinity for ectodermal tissues and have, furthermore, certain other characteristics in common,—minute size, virulence in high dilutions, survival in glycerine, etc.¹

EXPERIMENTAL.

The author felt that the observations of various workers summarized above, so contrary to the generally accepted theory of the ætiology of herpes, required first of all a careful repetition.

TECHNIQUE.

Material was obtained from herpetic lesions by the method described by Loewenstein (40). One or more linear scratches were made with the infected knife in the cornea of the animal to be inoculated. The scratches were made fairly deep, certainly going through Bowman's membrane. When the material to be inoculated had previously been suspended in liquid (either sterile normal salt or 50% glycerine) in addition to the scarification with the infected knife, several drops of the suspension were instilled into the conjunctival sac. At first whenever one eye of an animal was inoculated the other eye was also scarified in an exactly similar manner with a sterile knife and so served as a control. These controls resulted uniformly negatively and were, therefore, later omitted.

¹ For further articles by these and other authors consult bibliography.

It is, however, important to note in this connection that the authenticity of the virus of encephalitis has not been established beyond all question. Most investigators have found great difficulty in infecting rabbits with encephalitis material and since Oliver (23) and Wright and Craighead (24) have shown the existence of enzootic encephalitis frequently present among rabbits, the question arises as to whether the so-called virus of encephalitis is not merely a rabbit virus picked up in the course of frequent rabbit inoculations. The writer does not feel qualified to enter into this polemic, but the question as to whether or not a similar objection can be raised in relation to the virus of herpes will be discussed below. Doerr makes the interesting suggestion that the supposed virus of encephalitis may be merely the virus of herpes which has, as a secondary invader, entered the brain or spinal fluid of patients suffering with epidemic encephalitis.

RESULTS OF INOCULATION

NO. OF CASES	SOURCE OF MATERIAL	RESULT
<i>A. Herpes</i>		
2	Facial herpes uncomplicated	2 positive
4	Facial herpes with slight "cold"	4 positive
1	Facial herpes with severe "grippe"	1 positive
2	Facial herpes with pneumonia	2 positive
1	Facial herpes with asthmatic bronchitis (material kept in salt solution for two hours before inocu- lation)	1 negative
1	Facial herpes following trigeminal neurectomy	1 positive
2	Dendritic keratitis	2 positive
<hr/> Total 13	Total positive	<hr/> 12
<i>B. Non-herpetic Conditions</i>		
2	Keratitis profunda disciformis	negative
2	Corneal ulcers, not herpetic	negative
2	Corneal phyltenules	negative
1	Rosacea keratitis	negative
1	Normal labial epithelium	negative
1	Pustule at lip margin	negative
1	Blister from electric burn	negative
1	Nasal and buccal secretion from normal	negative
2	Nasal and buccal secretions from cases of common cold	negative
1	Nasal and buccal secretions from a case of infected antrum	negative
1	Nasal and buccal secretions from a case of acute pharyngitis	negative
		(a streptococcus ulcer developed in the inocu- lated rabbit's cornea)
<hr/> Total 15	Total positive	<hr/> 0

CONTROL EXPERIMENTS.

Control experiments were performed in relation to four possible sources of error:

(1) Trauma.

The reaction we were observing might be due merely to the trauma of inoculation. This possibility was eliminated by

frequent control experiments in which a rabbit's cornea was scarified with a sterile knife. In every such case the wound was completely healed in 48 hours.

(2) Local anæsthesia.

Loewenstein (40), and Luger and Lauda (41) used cocaine to anæsthetize the eyes of the rabbits which they inoculated. We found that the substitution of novocaine, holocaine, or general ether anæsthesia in place of cocaine in no way altered the results.

(3) The virus might be an invader of herpetic lesions, not their cause.

Loewenstein (40) and Luger and Lauda (41) conducted extensive experiments aimed to disclose this possibility. They inoculated rabbits with material obtained from a wide variety of non-herpetic lesions. All these inoculations failed to produce the typical reaction. They concluded that the virus was not present as a secondary invader in non-herpetic lesions.

The table given above confirms their results. See also Experiment II below.

(4) The virus might be a rabbit virus picked up in the course of the inoculations.

This possibility seemed to us particularly important because enzootic encephalitis is so very common among rabbits. Many of the pathological lesions found in the brains of rabbits inoculated with encephalitis material as described by Loewe and Strauss (19), and by Levaditi and Harvier (18) are not infrequently seen in supposedly healthy rabbits. This fact, as noted above, has been used with considerable force in the polemic over the supposed virus of encephalitis, and since that virus so closely resembles the one with which we are dealing the argument might be applied with equal force in our case. The following experiments were undertaken to discover whether by injuries of various sorts it was possible to induce a spontaneous infection of the herpetic type in a rabbit's cornea.

EXPERIMENT I.

Under cocaine anæsthesia the cornea of rabbit # 53 was exposed for $\frac{1}{2}$ hour to the negative electrode of a storage battery (4 volts, 2-3 amperes). The current reached the cornea through a thread soaked in salt solution. At the end

of $\frac{1}{2}$ hour a large area of the cornea was opaque, swollen, and denuded of epithelium. Immediately and again after 24 hours this injured cornea was inoculated with a mixture of the nasal and buccal secretions of two other healthy rabbits (# 40 and 45). During the next two days the eye became moderately congested but did not then nor later show the typical lesions. However an inoculation was made from this eye to rabbit # 41. Rabbit # 41 remained completely negative. Rabbits # 53 and 40 were subsequently shown to be susceptible to herpetic infection.

Similar experiments to this one were performed using bile, diphtheria toxin, and a protein to which the animal had been sensitized to produce the initial injury. In each experiment nasal and buccal secretions were obtained from different healthy rabbits. In no case was the resulting reaction at all similar to the typical herpetic infection and in no case was it transmissible to another rabbit. We were unable, then, to find, among healthy rabbits, carriers of the virus, though many of those we had used in these experiments were subsequently found to be susceptible to infection when inoculated either from human herpes or from infected rabbits.

Further evidence against the theory that the herpes virus is merely an enzoötic virus is to be found in the successful inoculation of man (see bibliography references 33, 34, 39); white rat (48) and guinea pig (41) reported by various writers.

TIME OF APPEARANCE OF VIRUS IN FACIAL HERPES.

In view of the suggestion that the virus with which we were dealing might be merely a secondary invader of the herpetic vesicle, it seemed important to discover how soon and how long after the appearance of the herpetic lesion the virus could be detected.

EXPERIMENT II.

CASE #10.—MacD. physician and co-worker with us in the laboratory who is subject to frequent attacks of labial herpes was requested to notify us at the very earliest appearance of an herpetic lesion. He presented himself one day stating that he had for the past two days felt a little poorly, he had been constipated and his head had felt "stuffy." He had had no nasal discharge, sneezing, nor fever. Two hours before he came to us he first noted a slight tingling and itching at a certain point on his lower lip. On examination a very slight hyperæmia and swelling was discovered in this region. Over its surface were scattered 3-4 minute

dew-drop like vesicles $\frac{1}{4}$ mm in diameter. After cleansing with alcohol one of these vesicles was incised with a knife which was then used to inoculate the left cornea of rabbit #44. A typical keratitis developed. The lesion on the patient's lip proved also to be a typical herpes.

EXPERIMENT III.

CASE #12.—A patient suffering with pneumonia at the Massachusetts General Hospital. Two weeks ago he had a cold in the head. Five days ago he developed a pain in the chest, cough, chills and fever, together with a severe pain on the left side of his face and the outbreak of a profuse crop of herpes. Examination revealed a large number of crusted lesions about his lips and on his left cheek. These bled easily when the crusts were lifted. Several of the crusts were removed and suspended in salt solution which was used $\frac{1}{2}$ hour later to inoculate rabbit #43. A typical keratitis developed.

CLINICAL COURSE IN RABBITS.

The clinical course of the disease in rabbits has been well described by Loewenstein (40), Luger and Lauda (41), and Doerr (30), (31), and his co-workers. We wish merely to record our confirmation of their findings.

The first signs of infection usually develop within 18–36 hours after inoculation. The incubation period may, however, be prolonged as much as 4 or 5 days. Such long incubation periods are usually associated with relatively mild infections, and can often be correlated either with an increased resistance of the host, as, for instance, when one eye of a rabbit is inoculated at a time when the other is already beginning to recover, or with a diminution in virulence of the virus, as, for instance, when the virus has been kept in normal salt solution on ice for an hour or more before inoculation. Examples of both these causes of prolonged incubation occurred several times in our series; however, several other cases of delayed reaction also occurred, in which no such explanation could be found, and in which the subsequent infection was by no means mild, indeed, in one case, unusually severe. Neglecting the occasional prolonged incubation the usual course of the infection is as follows:

Within 18-36 hours after inoculation the streak made in the cornea by the inoculating knife shows a number of minute irregularities along its margin as if it had been etched, and these irregularities on close examination are found to be due to minute superficial vesicles. After 48 hours a slight pericorneal congestion develops and the streak of inoculation becomes faintly opaque and stains readily with fluorescein, the line of stain having a number of circular excrescences at the sites of the vesicles which are now $\frac{1}{4}$ - $\frac{1}{2}$ mm in diameter, and have frequently shed their epithelium. On the third and fourth day the conjunctiva becomes markedly congested and swollen, a profuse purulent discharge develops, composed almost entirely of polymorphonuclear pseudo-eosinophilic leucocytes and fibrin. Smears from this pus stained by the gram or methylene blue stain do not show, up to the fourth or fifth day, any organisms. Later, various organisms, usually large gram positive cocci and bacilli, obviously secondary invaders, make their appearance. The opacity at the site of inoculation has in the mean time become more dense and wider, and a faint haze is often visible throughout the whole cornea. Fluorescein stain now reveals in addition to the original scratch numerous small circular spots scattered over the cornea $\frac{1}{4}$ -1mm in diameter, strikingly similar to those seen in superficial punctate keratitis and also in dendritic keratitis in man. Some of these spots may coalesce to form larger areas. In addition to these there are almost always branching trunks extending out over the cornea from the original scratch. These dendritic and punctate lesions can, of course, be faintly seen without the aid of fluorescein but the stain brings them out with great vividness. A moderate iritis is often present. At this time and later the cornea often, though not invariably, exhibits a marked diminution in sensitivity.

After the fourth to seventh day the process begins to subside, the secretions become less profuse, the lids are covered with dry crusts, but in general the opacity and denudation of the cornea proceed for several days. The ultimate result for the cornea after a period of months may lie anywhere from the faintest opacity involving only the line of inoculation, to a dense leucoma involving the whole cornea. The latter may be due to a secondary infection.

Out of 58 rabbits successfully inoculated corneally, 12 developed encephalitic symptoms. Of these 6 died. The clinical course of these cases is as follows: From 7-14 days after inoculation the animal became irritable, starting at the slightest noise or touch, and at times rushed furiously and blindly about the cage. Some previously tame animals became quite ferocious at this period. All of them showed a very marked tendency to turn their heads toward the side of the affected eye. In the milder cases these symptoms passed off in 2-5 days. In others the animal developed paralysis of one or several limbs and severe opisthotonic convulsions. All those that manifested these grave symptoms died. Doerr and Schnabel (31) call attention to paralysis of eye muscles causing strabismus. We are, however, at a loss to know how strabismus can be detected in an animal which has no binocular vision. Profuse salivation as described by these authors occurred frequently, but not invariably, in our experiments. The virus can be found in the saliva of these animals.

EXPERIMENT IV.

Rabbit #65 was inoculated in both corneæ on March 17th with herpes virus (strain #10, which had already undergone 2 animal passages.)

March 20th. Violently inflamed eyes with profuse purulent discharge.

March 26th. Inflammation subsiding leaving a large opacity in each cornea.

March 27th. Same. Does not seem ill.

March 28th. Very ill, paralysis of right fore and hind legs, profuse salivation, frequent opisthotonic convulsions. Turns head to left, slow horizontal nystagmus of left, none of right eye, trismus, twitching of various muscles.

At this point an inoculation was made from the saliva of this rabbit to the cornea of a fresh rabbit, #70. The cornea of rabbit #70 was scratched with a sterile knife, and a cotton swab that had been dipped in the saliva of rabbit #65 was gently stroked over the scratches and some shreds of saliva were deposited in the conjunctival sac. An unusually severe but perfectly typical infection developed from which the virus was subsequently transmitted to other rabbits. Experiment I showing the absence of the virus in the saliva of normal rabbits serves as a control for this experiment.

It is interesting to note that the strain of herpes virus used in this experiment was by far the most virulent of those we encountered. It was obtained from a very severe case of dendritic keratitis.

According to Netter the virus of encephalitis can be found in the salivary glands of infected rabbits. Levaditi has been unable to confirm this view.

PATHOLOGY.

The tissues examined were fixed in Zenker's fluid, embedded in paraffin and stained with Wolbach's modified Giemsa stain.

EYE.

The pathological picture of the cornea varies greatly according to the stage of the infection. Eyes examined 24 hours after inoculation show along the line of inoculation, and in small foci close by, a disorganization of the normal relations of the epithelial cells with a disappearance of the columnar arrangement of the basal cells. Many of the cells are swollen and vacuolated. Some have fused together forming multinucleated giant cells.¹ In the nuclei of many cells the so-called "herpes-bodies" of Lipschuetz (39) are readily seen,—irregular masses of eosinophilic material gathered at the center of the nucleus and surrounded by a clear unstained zone. Chromatin network and nucleolus are completely lost from these nuclei. Whether or not these bodies are specific to herpetic infections as Lipschuetz claims, only future investigation can decide. The epithelium is in places raised by minute collections of fluid and, even in the early stages, has been shed over small areas.

Beneath Bowman's membrane there is an accumulation of polymorphonuclear leucocytes which occasionally are seen to be eroding the membrane and migrating into the epithelium. They are arranged at times in densely packed groups, forming a small disk of infiltrate just beneath Bowman's membrane and producing a picture strikingly similar to that seen in superficial punctate keratitis as described by Verhoeff (14). At the limbus there is the usual inflammatory reaction consisting in

¹ First noted by Loewenstein (40).

marked congestion and an infiltration of polymorphonuclear leucocytes and small lymphocytes, the latter predominating.

In later stages (4th to 7th day) the cornea is widely but not deeply ulcerated. The polymorphonuclear infiltrate has increased in density about the margins of the ulcer. The pericorneal reaction is more marked. In extremely severe infections the whole thickness of the cornea may become necrotic as evidenced by the absence of corneal corpuscles. Only a few leucocytes are then found in the most severely affected regions but on the posterior surface of Descemet's membrane and raising up the endothelium they are then present in a dense layer. In such unusually severe infections the iris is found to be moderately infiltrated with lymphocytes and polymorphonuclear leucocytes and its capillaries are widely dilated. No lesions were found in the lens, vitreous, retina, choroid, or optic nerve.

BRAIN.

The pathology of the brain in this condition has been described in detail by Doerr and Schnabel (31) and by Levaditi, Harvier, and Nicolau (39). The lesions found resemble those seen in human epidemic encephalitis, but it should be remembered that identical lesions are found occasionally in supposedly healthy stock rabbits. We have seen these lesions in both infected and control rabbits. They consist in perivascular round cell infiltrations, slight chronic meningitis, small foci of round-cell infiltration in the gray matter usually surrounding degenerated ganglion cells. We did not find the organisms observed by Wright and Craighead (24) in the enzootic encephalitis that they have described. In our short series of observations we found these lesions much more common in infected than in control animals but we would be far from suggesting that they represent the specific pathology of this disease.

The pathology of the gasserian ganglion and trigeminal nerve will be described below.

PATH OF VIRUS FROM CORNEA TO BRAIN.

Doerr and Schnabel (31) believed that the virus reaches the brain from the cornea by means of the blood stream and they

were able to isolate the virus from the heart's blood of a severely infected animal. Levaditi, Harvier, and Nicolau (38) have thrown some doubt on this conclusion by showing that the resistance of the mesodermal tissues of the animal's body is very high for this virus, and that infection is as a rule possible only if the virus is introduced into ectodermal tissue—skin, cornea, brain, or peripheral nerves. Indeed, animals readily withstand huge doses of the virus given intravenously. These authors believed that the virus entered into the interior of the eye and reached the brain by way of the optic nerve, and they were able to demonstrate the presence of the virus in the aqueous fluid and optic nerve a certain number of days after infection of the cornea. These experiments were done with the virus of encephalitis, not that of herpes.

While not being in a position to refute this theory we must nevertheless state that it seems to us highly improbable that any large number of organisms should pass through an intact membrane of Descemet or that they should multiply in the interior of the eye and along the course of the optic nerve without attracting leucocytes and producing pathological evidence of their presence. No such evidence has been adduced by these authors, and repeated examinations by us of the interior of the eye and of the optic nerve failed to reveal anything except a deposit of leucocytes on the posterior surface of the cornea and a mild iritis such as one would naturally expect as the result of a severe corneal infection.

From the human side there is much evidence pointing to an intimate relation between herpetic infections and the sensory nerves, in particular the trigeminal nerve. In fact febrile herpes occurs but rarely outside of the genital regions and the domain of the trigeminal nerve. Hypæsthesia of the cornea in cases of herpetic keratitis in areas not visibly affected, and hypæsthesia and hyperæsthesia of the areas involved in facial herpes after the subsidence of the infection are well known and point strongly to an involvement of the sensory nerves.

Cushing (29) has pointed out that herpes very commonly follows operations on the gasserian ganglion in cases of trigeminal neuralgia and he states that when the ganglion is removed herpes are rare, but when a peripheral branch is cut, herpes frequently appear on the opposite side or in the domain



Figure 1. Furrow of inoculation in rabbit's cornea after 24 hrs. Section cut slightly to the left. High magnification. F. furrow of inoculation. W. white bodies. G. giant cell. S. corneal stroma.

Figure 2. Very early lesion showing accumulation of lymphocytes and polymorphonuclear cells in the epithelium. E. epithelium. S. stroma. G. giant cell. P. polymorphonuclear leukocytes. High dry magnification.

Figure 3. Advanced lesion (8 days) with infiltration and necrosis of corneal tissue. D. Descemet's membrane. Note the presence of corneal corpora in the lower layers of the epithelium. Most of the nuclei in the upper layers are those of polymorphonuclear leukocytes. Low power.

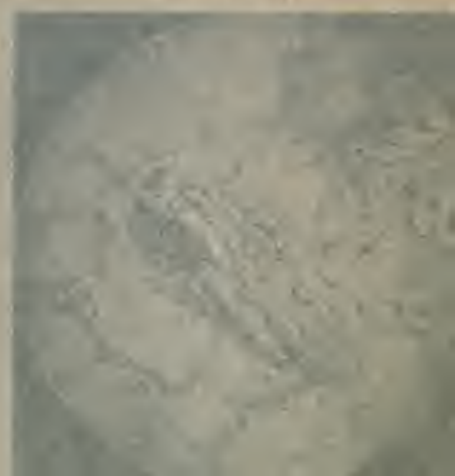
Figure 4. Perivascular infiltration in periphery. Low power.

Figure 5. Focus of small round cells in corneal nerve. High dry power.

Figure 6. Giant cell showing typical type of lesion. W. normal epithelium cell. A. giant cell. High dry power.

Figure 7. High magnification of same area as Figure 6.

Figure 8. Giant cell showing typical type of lesion. G. the giant cell. High dry power.



were able to isolate the virus from the host's blood of a severely infected animal. Gerwitz, Hughes and Nicolas (4) have shown how easily the virus can be isolated by showing that the maximum in the percentage of virus of the animal's body is very high for a short time, and no infection is as a rule possible with a virus so virulent as this. Subdermal tissue—skin, connective tissue, or peritoneal cavity, indeed, animals readily acquire the disease if the virus goes intravenously. These authors believed that the virus entered into the interior of the animal through the break in the skin of the cornea, and they were able to demonstrate the presence of the virus in the lacrimal fluid and not in the blood. A certain number of experiments of the comparative value of these data with the virus of encephalitis, or that of herpes.

ILLUSTRATIONS.

- Figure 1.** Furrow of inoculation in rabbit's cornea after 24 hrs. Section cut slightly on the bias. High dry magnification. *F.* furrow of inoculation. *H.* herpes bodies. *G.* giant cell. *S.* corneal stroma.
- Figure 2.** Very early lesion showing polymorphonuclear accumulation beneath Bowman's membrane and changes in the epithelium. *E.* epithelium. *S.* stroma. *G.* giant cell. *P.* polymorphonuclear leucocytes. High dry magnification.
- Figure 3.** Advanced lesion (8 days) with ulceration and necrosis of cornea and marked Descemetitis. *D.* Descemet's membrane. Note the practical absence of corneal corpuscles in the lower layers of the cornea. Most of the nuclei in the upper layers are those of polymorphonuclear leucocytes. Low power.
- Figure 4.** Perivascular infiltrate in brain. Low power.
- Figure 5.** Focus of small round cells in a ciliary nerve. High dry power.
- Figure 6.** Gasserian ganglion showing first type of lesion. *N.* normal ganglion cell. *A.* abnormal cell. High dry power.
- Figure 7.** Higher magnification of same specimen as figure 6.
- Figure 8.** Gasserian ganglion showing second type of lesion. *G.* degenerated ganglion cells. High dry power.

ILLUSTRATING DR. JONAS S. FRIEDENWALD'S ARTICLE ON "STUDIES IN THE VIRUS
OF HERPES SIMPLEX."

120²

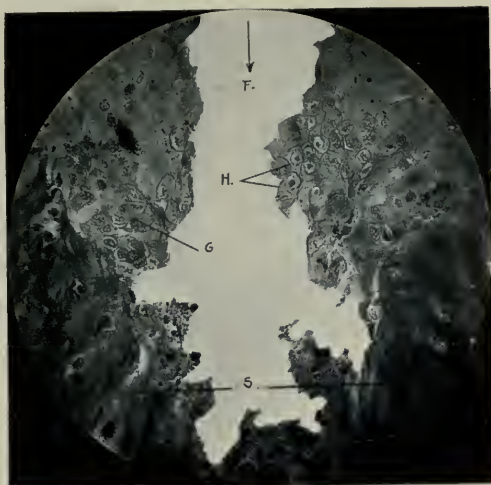


FIG. 1



FIG. 2

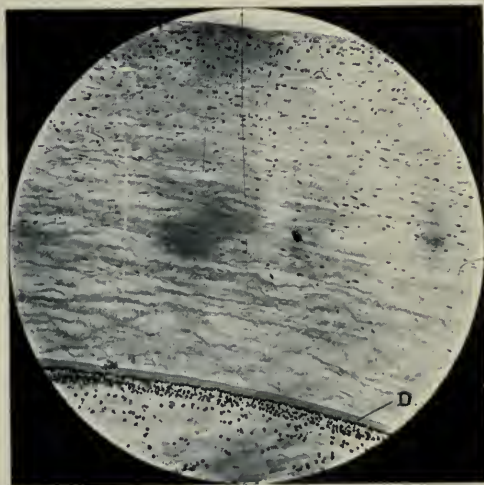


FIG. 3

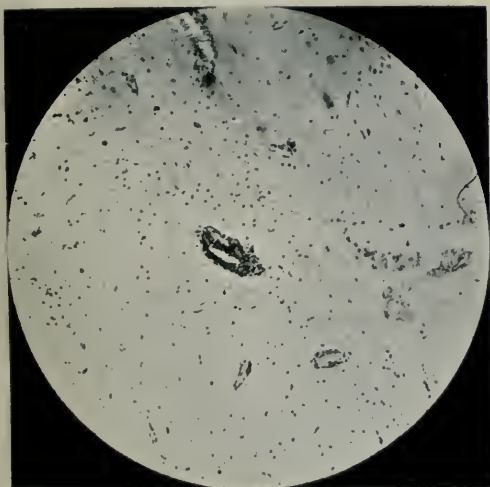


FIG. 4

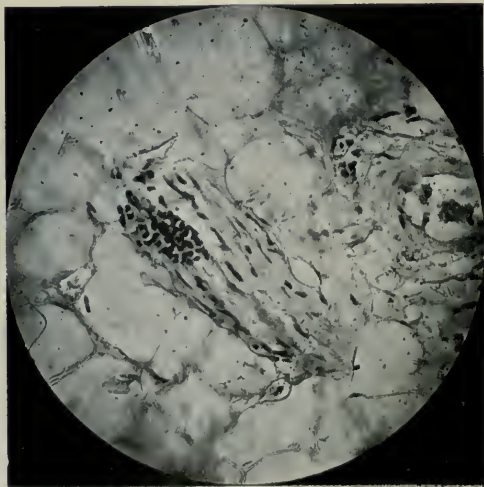
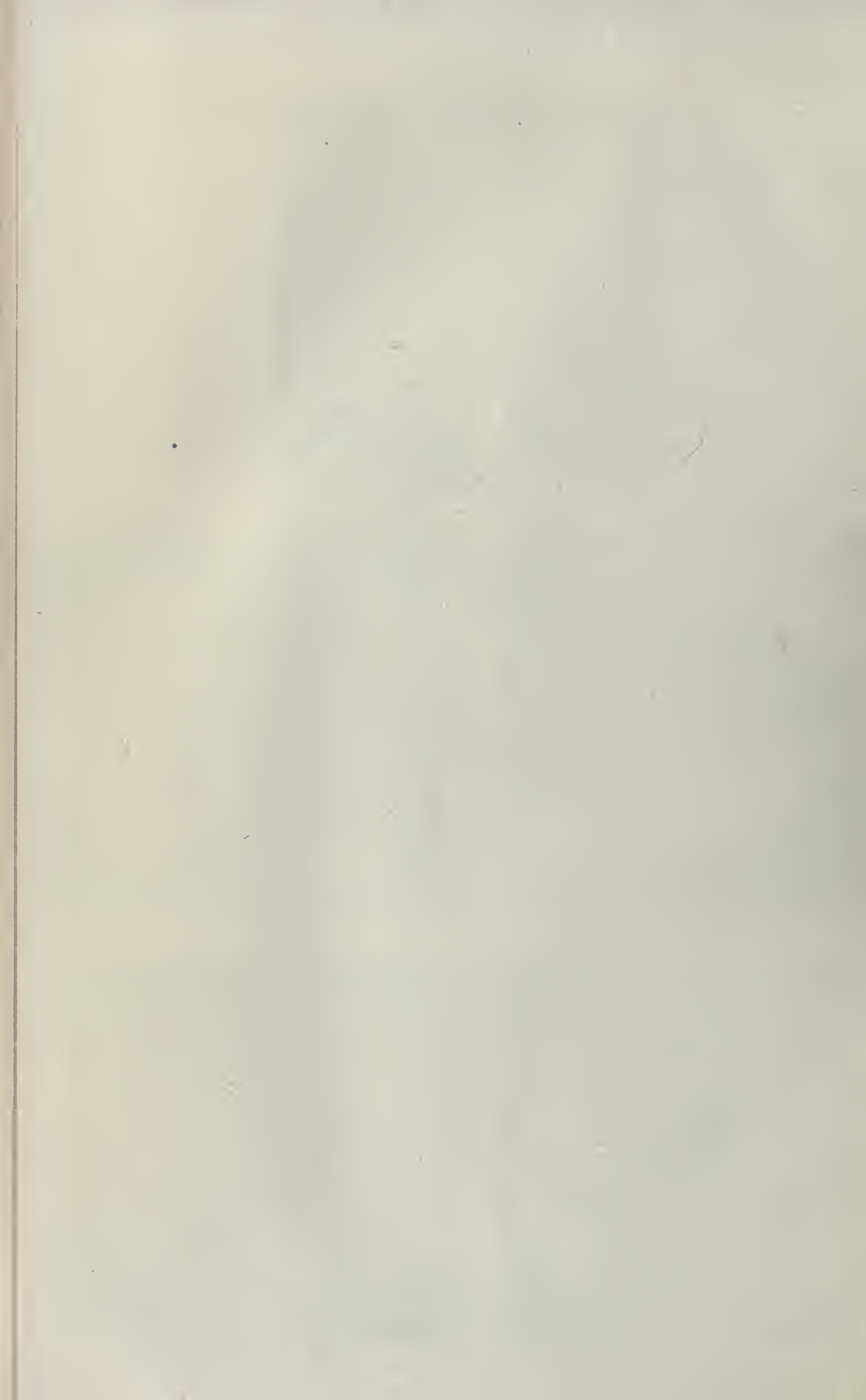


FIG. 5



ILLUSTRATING DR. JONAS S. FRIEDENWALD'S ARTICLE ON "STUDIES IN THE VIRUS OF HERPES SIMPLEX."

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120

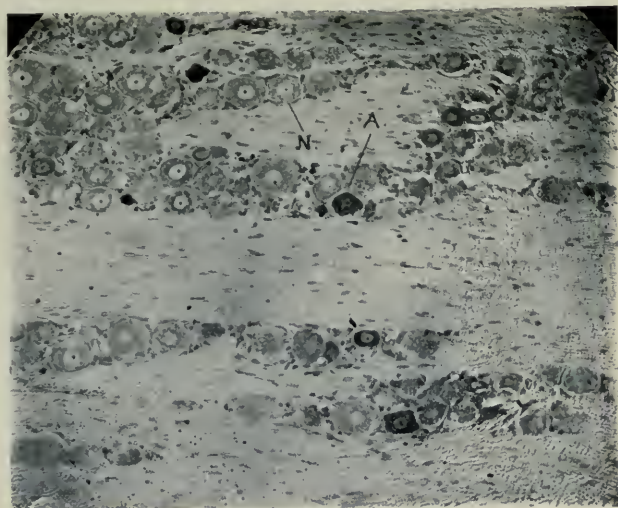


FIG. 6

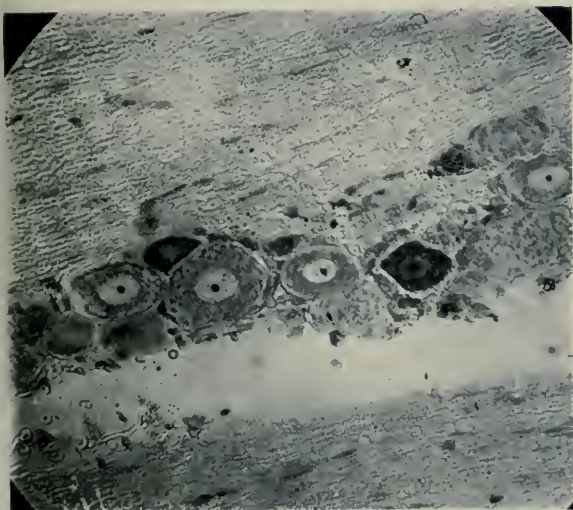


FIG. 7

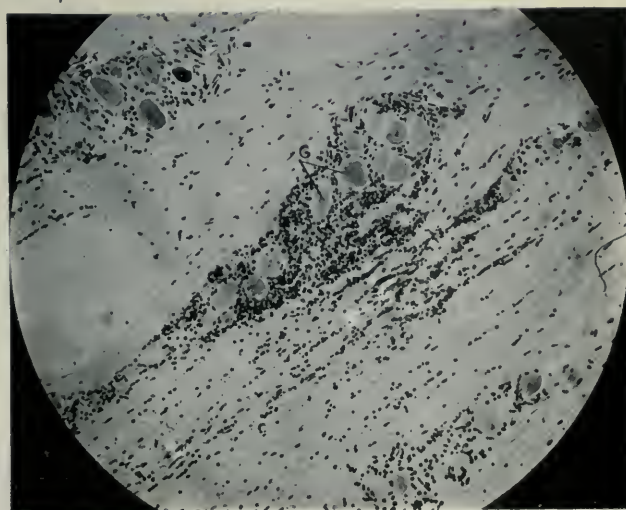


FIG. 8

of one of the uninjured branches. This would point strongly to the ganglion as the focus of the infection whence the virus travels peripherally or centrally.¹ Furthermore Howard (13) has observed lesions in the gasserian ganglia of patients with herpes complicating pneumonia and epidemic meningitis and Gilbert (12) has seen lesions in the ciliary nerves of a case of herpetic keratitis. A final and important bit of evidence from the human side is the close similarity between the lesions in febrile herpes and herpes zoster; the latter is known to be an affection of the sensory ganglia and their peripheral nerve fibers.

These considerations led us to investigate what part, if any, the gasserian ganglion and trigeminal nerve played in the disease in rabbits.

1. The presence of the virus of herpes in the gasserian ganglia of rabbits whose cornea have been infected.

EXPERIMENT V.

Rabbit #73 was inoculated in both eyes with a virus (S 10) which had already undergone 5 successful animal passages. The typical corneal lesions developed from which, on the fourth day, the virus was recovered and successfully inoculated into rabbit #71.

Three days later, namely on the seventh day after inoculation, the corneal lesions were subsiding, leaving large opacities. The rabbit seemed in no way ill, he was eating well, and showed no evidences of paralyses. He was killed and the right gasserian ganglion was removed, emulsified in salt solution, and inoculated into the cornea of rabbit #74. This rabbit developed a perfectly typical and severe keratitis

¹ The reader may have some difficulty in accepting the notion that herpes following operation on the trigeminal nerve is due to a virus. It cannot however, be due merely to trauma since, as stated, the herpes commonly appears in the domain of the uninjured nerve. The outcropping of herpes in these cases is commonly associated with slight fever, sometimes with signs of mild meningeal irritation and increased cell count in the spinal fluid,—all factors pointing to an infection. We have, moreover, recovered the virus from the facial herpes of such a case. If, as seems indicated, the herpes virus is frequently present in the gasserian ganglia of persons suffering with trigeminal neuralgia one may well ask is it present also in the ganglia of normal persons, and what is its possible relationship to the tic douloureux.

and from his cornea the virus was successfully inoculated into other rabbits.

2. Pathology of the gasserian ganglion and ciliary nerves.

At various intervals after corneal inoculation, both before and after the development of symptoms of cerebral infection, rabbits were killed and their gasserian ganglia were subjected to microscopic examination. Every ganglion so examined showed lesions not found in normal controls. The lesions were of two types.

The first type of lesion was confined to the ganglion cells. Scattered among perfectly normal looking cells one found here and there a ganglion cell whose cytoplasm was considerably shrunken and packed with very dense masses of deeply staining basophilic material. Various degrees of this condition are seen in one and the same section, from cells which seem to have merely an unusually large amount of the normally present Nissl bodies to cells which appear as solid almost structureless deeply staining masses, their nuclei being wholly obscured. These basophilic masses are irregular in shape, hazy in outline, and without internal structure, and could not be confused with the intracellular masses of organisms in the enzootic disease described by Wright and Craighead.¹

The second type of lesion presents a more familiar picture. Here we see the ganglion infiltrated with small round cells which are found forming a mantle about the venules and capillaries and surrounding, and at times invading, degenerated ganglion cells,—namely ganglion cells which have almost completely lost their staining properties and from which the nuclear outline has completely or almost completely disappeared. The picture is identical with that seen among the anterior horn cells in poliomyelitis.²

¹ Since the completion of this work my attention has been called to the fact that there exist in normal sensory ganglia two types of ganglion cells which can be differentiated by various special stains as chromophile and chromophobe. I am not now in a position to repeat the experiments which I am reporting and therefore feel a certain hesitancy in maintaining that the deep staining cells are a pathological finding. However, the fact remains that they were not to be found in the controls which I instituted at the time.

² This type of lesion has been described by Stocker (47).

Not infrequently the two types of lesions are simultaneously present. Their interpretation is a matter of much difficulty, but it would seem probable that the shrunken dark staining cells are in the process of reacting to the growth of the virus along their peripheral axones, while the inflammatory lesions are produced by the actual presence of the virus in the ganglion itself. That pathological influences are acting along the course of the sensory nerves can be seen in the sections of the orbital tissue which not infrequently reveal foci of small round cells imbedded in some of the ciliary nerves.

In view of this demonstration of the intimate relation of herpetic infection to the sensory nerves it becomes important to consider the mode of entry of the virus in human cases. Levaditi (38) and Doerr (31) have shown that the virus of herpes is sometimes present in the buccal secretions of persons suffering with herpes and also of some normal individuals who may reasonably be supposed to be carriers of the disease. This, together with the clinical fact that the onset of herpes is so commonly associated with a mild or severe upper respiratory infection, would lead one to conclude that the portal of entry lies somewhere in the upper respiratory passages. No evidence is on hand to indicate whether the virus in human infections reaches the nerve from the mucous membrane directly or via the blood stream. It should be remembered in this connection that in many individuals the maxillary branch of the trigeminal nerve lies in the roof of the maxillary sinus covered only by mucosa. It is in the domain of this branch that febrile herpes most commonly occur.

Dr. F. H. Verhoeff has suggested that the virus of herpes may be a cause of optic neuritis, especially of those cases of retrobulbar optic neuritis in which the ophthalmologist is led to suspect the nasal sinuses but the rhinologist unable to demonstrate any lesion.

HERPES IN MAN AND RABBITS.

A short comparison of the course of herpetic infection in man and rabbits may perhaps be of interest. Herpetic (herpes simplex) skin lesions in man are acute and of short duration as in rabbits. Corneal herpes, however, is in man a subacute

affection often of extremely long duration, while in rabbits it is acute and always begins to subside within a week. Neglecting this difference which can readily be accounted for by the difference in resistances of the hosts the corneal lesions in man and rabbit are strikingly similar. Lipschuetz (39) has found "herpes bodies" in the epithelial cells in human herpes of the skin, and Fuchs and Lauda (34) have found them in corneal herpes in man artificially produced in an eye about to be enucleated for some other cause. The similarity of the distribution of the corneal infiltrate in rabbit infection to that seen by Verhoeff (14) in superficial punctate keratitis in man has been noted above. Gilbert (12) found a neuritis and perineuritis of the ciliary nerves in a human case and Howard (13) has described inflammatory lesions in the sensory ganglia corresponding to areas involved in herpes. In spite of careful search we were unable to find budding capillaries in the irides of infected rabbits similar to those noted by Verhoeff (14) in his case of superficial punctate keratitis.

Whether or not herpetic encephalitis occurs in man as in rabbits it is at present impossible to say. Symptoms of meningitis have been frequently noted in cases of herpes, supposedly herpes zoster but possibly merely unusually severe cases of herpes simplex.

Levaditi and others believe that all cases of epidemic encephalitis are what we have called "herpetic encephalitis," namely that the virus of encephalitis is merely a herpes virus of unusual virulence. Notwithstanding his desire to support this hypothesis Netter was unable to find herpes in more than 2% of a large number of cases of encephalitis. Experience with the disease in rabbits would lead one to expect just such a condition as Netter found. If herpes and encephalitis are manifestations of infection with the same organism one would not expect them to be simultaneously present but one would look for the herpes during the second week or perhaps even the third week *before* the onset of the encephalitis.

THERAPY.

We had found that the corneal infection of rabbits ran its course with great regularity, and little variation was seen in

the severity of the disease when rabbits of equal size and age were inoculated at the same time from the same source. In particular if a rabbit was inoculated in both eyes the reaction of the two eyes was found to be practically identical. Here then was an obvious and easily controlled method for determining the value of various therapeutic agents. The study was limited to local applications of various medicaments.

SUBSTANCES TESTED.

Argyrol	25%	instilled every 2 hours.
Mercurochrome	1%	" " " "
Holocaine	1%	" " " "
Zinc Sulphate	0.25%	" " " "
Cocaine	4%	" " " "
Tincture of Iodine full strength applied daily for 2 or 3 days after anæsthetizing cornea with cocaine.		
Ox bile (Fel bovis U. S. P.) approx. 10% applied daily for 2 or 3 days after anæsthetizing cornea with cocaine.		

METHOD.

Both eyes of a young rabbit were inoculated simultaneously from the same source. Twenty-four to 48 hours after inoculation treatment was begun with the drug to be tested, one eye being treated, the other being kept as a control. Treatment was continued until the height of the disease had been passed and the condition was subsiding. Records were kept of the severity of each symptom,—blepharospasm, congestion, secretion, corneal anæsthesia, opacity, area stainable with fluoresceine, etc., together with the duration of the illness until disappearance of all congestion, and the amount of opacity at that time.¹

RESULTS.

We regret to report that the results of these experiments were wholly negative. None of the substances used were seen to have the slightest beneficial effect on the course of the disease

¹ In later experiments for the sake of economy, 3 or 4 rabbits were inoculated at one time and all but one or two of the infected eyes were treated, the remainder constituted the control.

in rabbits. Cocaine in the strength used and ox bile were both definitely harmful. The demonstration of the deleterious effect of cocaine is in accord with clinical experience and is analogous to the findings of Levaditi, Harvier, and Nicolau who showed that general anæsthetics, chloral, ether, and chloroform, greatly increased the severity and shortened the incubation period of the disease produced in rabbits by the virus of encephalitis.

It is not easy to translate these findings into terms relating to the treatment of herpetic keratitis in man because the disease runs a much more acute and severe course in rabbits, giving less opportunity for successful treatment, however it seems beyond question that none of the remedies used are in any sense specific for the disease, that they can hardly be more than mild palliatives and that at the present stage of knowledge vigorous treatment would be contraindicated. The frequent use of cocaine should be avoided.

CONCLUSIONS.

1. Herpes simplex in both its corneal and facial manifestations is due to a specific virus.
2. This virus is found constantly in the lesions of herpes simplex but not in lesions of any other condition examined.¹ It can be found in the herpes at the time of their earliest appearance, during the vesicular stage, and, at times, in late crusted lesions.
3. The virus is highly infectious for rabbits, causing in them a disease which in many respects resembles herpetic keratitis in man.
4. A certain number of rabbits whose corneæ have been infected with this virus develop an acute and often fatal encephalitis.
5. The pathology of experimental herpetic keratitis in rabbits resembles that of herpetic keratitis in man.
6. The path of the virus from the cornea of a rabbit to its brain is probably along the sensory nerves of the cornea.
7. Treatment of experimental herpetic keratitis by the

¹ Other workers have found the virus to be occasionally present in the saliva of normal and infected persons.

methods usually used in the treatment of herpetic keratitis in man produced no favorable effect on the course of the disease. The use of strong solutions of cocaine produced a deleterious effect.

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A CASE OF MESOBLASTIC LEIOMYOMA OF THE IRIS.

BY DR. F. H. VERHOEFF.

(FROM THE MASSACHUSETTS CHARITABLE EYE AND EAR INFIRMARY.)

(*With three illustrations on Text-Plate V.*)

IN the literature there have been described as myomata of the iris, three tumors, and as myomata of the ciliary body, six tumors. In addition to these, a tumor described by Dreschfeld as a sarcoma of the iris has been regarded by some observers as a myoma. In none of these cases was conclusive evidence brought forward that the tumor was really a myoma, so that considerable doubt exists as to whether or not a myoma of the uveal tract has ever actually occurred. In the following case of tumor of the iris, the general character of the cells as shown by ordinary stains together with the presence of myoglin fibrils as demonstrated by differential staining, leave no doubt that the tumor was a myoma. For the privilege of reporting the clinical features of this case I am indebted to Dr. Myles Standish.

CASE:

Martin K. S., aged 33, admitted to the Massachusetts Charitable Eye and Ear Infirmary, May 21, 1904, service of Dr. Standish. The patient states that a growth has always been present on the iris of his left eye but that it has doubled in size within the past two years. Examination: Right eye normal, vision = $\frac{3}{8}$. The left eye is also normal, except for the presence of a tumor in the anterior chamber, and its vision is normal. The tumor is situated in the lower outer quadrant, extends from beneath the corneal limbus to the pupillary margin, measures about 5mm x 4mm in size, and is in contact with the cornea. No connection of the tumor

ILLUSTRATING DR. F. H. VERHOEFF'S ARTICLE ON "A CASE OF MESOBLASTIC
LEIOMYOMA OF THE IRIS."

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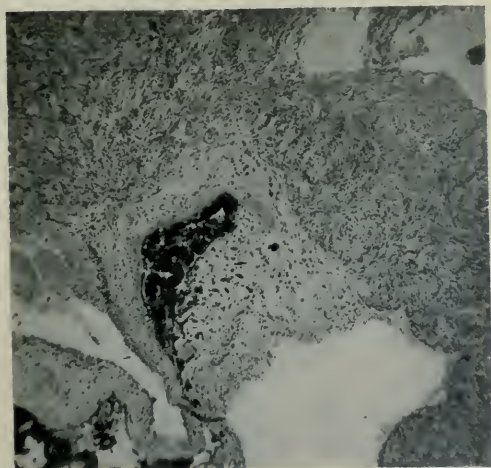


FIG. 1

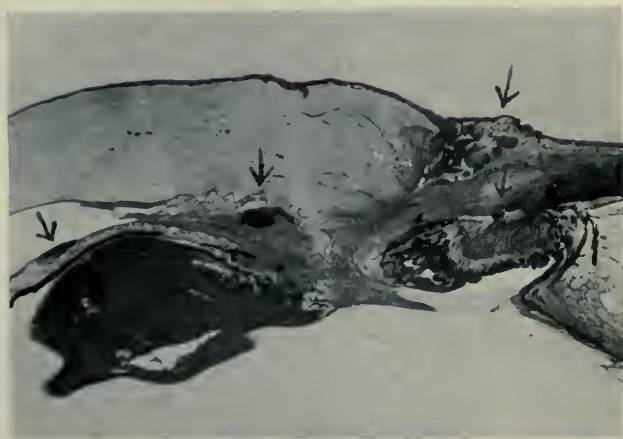


FIG. 2

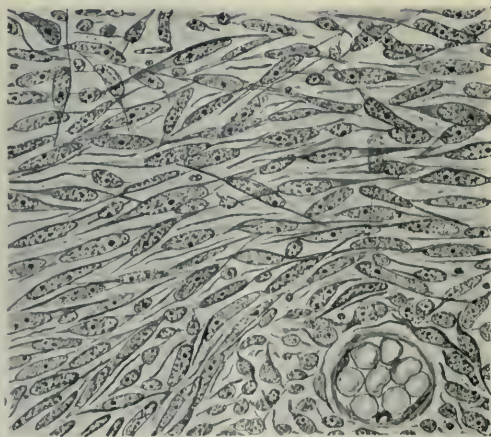


FIG. 3

with the iris can be definitely seen, but apparently it is connected with the latter near its root.

The tumor is pinkish in color, and, as seen with the corneal loup, has a papillary appearance, each process containing a loop of blood vessels. There is a small hemorrhage on the surface of the tumor and a small hyphemia at the bottom of the anterior chamber.

Operation.—Ether Narcosis.

Incision made through sclera $1\frac{1}{2}$ mm behind limbus below site of tumor. Root of iris grasped with forceps, pulled out and excised. Tumor, apparently completely removed with iris, preserved for microscopic examination.

May 22d. A large portion of the tumor still remains within the eye, so much, in fact, that the impression is given that none of the tumor has been removed.

Operation.—Wound reopened and another unsuccessful attempt made to remove the tumor with forceps. Suction instrument then used, also without success.

May 23d. Anterior chamber reformed.

May 24th. Within the coloboma the tumor appears as an irregular gray mass entirely unconnected with the iris or ciliary body. Eye considerably congested. Discharged.

The patient then consulted Dr. Standish privately, from whose records the following notes were obtained:

July 23, 1904. Eye quiet. The tumor looks solid and lobulated and measures 5 mm x 2 mm in size. It has become vascularized by vessels extending from beneath the corneal limbus.

Dec. 19, 1905. Tumor 3 mm x 2 mm in size. Patient states that there has been a hemorrhage into the anterior chamber since previous visit.

Oct., 1908. Unchanged.

March 12, 1920. Patient states that three years ago the growth began to increase in size. There have been several hemorrhages in the eye of late. The growth is pinkish in color and lies in the coloboma free from the iris, but at the periphery has a thin pedicle which extends beneath the limbus. V. O. S. $\frac{1}{8}$. V. O. D. $\frac{1}{8}$.

March 24, 1920. *Operation.*

Incision made with broad bent needle at site of former incision. Attempt to remove tumor with forceps failed, owing to softness of mass. Attempt with hook also failed. Tumor finally expressed with a spoon, leaving only the thin pedicle behind. A small amount of vitreous (lens matter?) lost.

April 8th. Lens cataractous and swollen. Marked congestion.

April 16th. Tension subnormal.

April 24th. Less congestion.

May 17th. Less congestion.

May 19, 1920. Tension very low. Enucleation.

PATHOLOGICAL EXAMINATION.

(857) First specimen: The specimen consists of a piece of iris with tumor attached, the latter measuring 4.25mm in diameter. Fixation in Zenker's fluid.

Microscopic Examination.—The tumor is attached to the iris, some distance from the iris root, by a greatly constricted base about 1mm in diameter (Fig. 1). It arises sharply from the anterior boundary layer and has not invaded the iris stroma. It is composed of long spindle-cells arranged in bundles running in various directions. The nuclei are long and rod-shaped and some of them are slightly curved. They measure 15 to 20 microns in length and 2.5 to 3.3 microns in thickness. When seen under high magnification, each cell is found to terminate in a long process. These processes give the tissue a highly fibrillated appearance. The nuclei show a marked tendency to arrange themselves in rows within the bundles, so that the appearance of alternate zones of nuclei and fibrils is often produced. Sections stained in phosphotungstic acid hematoxylin show definitely stained fine fibrils running along the borders of the cells and the processes (Fig. 3).

The tumor is only moderately vascularized. All of the vessels have definite connective tissue walls as shown by Mallory's connective tissue stain, no blood spaces being found which are bordered directly by tumor cells. The tumor cells have no constant arrangement with respect to the vessels, but occasionally they encircle the larger vessels. The connective tissue stain shows no collagen between the tumor cells except at the base of the tumor where a few collagen fibrils extend for a very short distance from the iris into the tumor.

None of the spindle-cells is pigmented, but a few (five in one section) typical branching chromatophores are found between the spindle-cells near some of the blood vessels. These no doubt originally belonged to the iris. The tumor shows no capsule in the sections, but its surface is ragged, indicating that a part of the tumor, including the original surface, has been torn off in the removal of the tumor. No mitotic figures are found.

The iris, in general, is normal. In places the anterior boundary layer is thickened as is often the case in a normal iris, and contains more pigment cells than elsewhere. At

the base of the tumor, the stroma contains numerous clump cells.

SECOND SPECIMEN REMOVED 16 YEARS LATER.

This consists of several fragments of tumor tissue. Fixation in 10% formalin. Microscopic examination shows the tumor to have the same structure as in the first specimen except that the cells are, in general, somewhat larger. No mitotic figures are found. None of the cells is pigmented.

THIRD SPECIMEN.

This consists of the entire eye. Fixation in 10% formalin.

At the limbus there is a healed operative wound. The cornea in the vicinity is vascularized and swollen to twice its normal thickness but is free from infiltration with inflammatory cells. Incorporated within the wound there are a number of small circumscribed nodules of tumor cells (Fig. 2). Some of these nodules are just beneath the surface epithelium. They consist entirely of unpigmented spindle-cells. The iris is absent in this situation and a mass of granulation tissue extends from the inner portion of the wound into the lens, the capsule of which has been ruptured. The lens is here considerably infiltrated with endothelial phagocytes, but no pus cells. At one side of the wound where the iris is present there is a flat sharply circumscribed nodule of tumor cells filling the filtration angle. This is composed of unpigmented spindle-cells and is $1\frac{1}{5}$ mm in diameter. It has not invaded the ligamentum pectinatum. On this side several discrete tumor nodules of spindle-cells are found involving the surface of the iris. On the side opposite the wound there is one large nodule situated exactly at the pupillary margin and several minute nodules towards the periphery. All of the nodules have smooth surfaces. Some of them are sharply delimited from the iris stroma, but others send short irregular projections into it. The cells of the larger nodules are as large as those of the original tumor, but the cells of the smaller nodules are correspondingly small in size. The tumor cells have nowhere become free and infiltrated the neighboring tissues. The iris stroma shows slight fibrosis and the surface of the iris has groups of endothelial phagocytes adherent to it. The pupil is closed by a vascularized membrane which extends from the pupillary margin over the lens. The lens, in addition to the infiltration already mentioned, shows the usual changes of a recent traumatic cataract and an anterior capsular cataract. Near the wound the swollen cortical matter protrudes through the gap in the capsule and presses against the cornea. Between the lens matter and the cornea are several nodules of tumor cells.

The tissues about the filtration angle have nowhere been

involved by the tumor and, except in the vicinity of the wound, the angle is freely open.

The ciliary body is congested and edematous but is free from cellular infiltration. Adjacent to the site of the iris coloboma as well as elsewhere the ciliary body shows no indication that the tumor has ever been attached to it. At the site of the wound the ciliary processes are adherent to the fibrous tissue extending from the latter, and the whole ciliary body has been folded and dragged forward by the resulting traction. On the opposite side the ciliary body has also been dragged forward by traction of the iris, but to a less extent.

On the side of the wound, and to a less extent on the opposite side, the choroid and posterior part of the ciliary body are separated from the sclera by a serous exudate. The choroid is congested throughout. The retina is *in situ* and normal except near the disk where it is edematous. The optic disk is greatly swollen but is free from cellular infiltration.

REMARKS.

The feature of chief interest in this case is that it is the first in which a tumor of the iris has been demonstrated by means of special staining to be a myoma. Even after ordinary staining, the long spindle-shaped appearance of the cells, their typical rod-shaped nuclei, and the tendency of the cells to occur in bundles with the nuclei arranged in rows, strongly suggested a myoma, but the presence of fibrils coursing along the cells and their terminal processes, as shown by Mallory's phosphotungstic hematoxylin stain, left no doubt as to the nature of the growth.

So far as I know, no attempt to ascertain whether or not fibrils occur in relation with the cells of spindle-cell sarcomata of the uvea, has hitherto been recorded. It may be well for me to state, therefore, that I have examined sections of a number of spindle-cell sarcomata of the choroid and ciliary body stained in Mallory's phosphotungstic and hematoxylin and have failed to find any fibrils in relation with the tumor cells proper. I have, however, found fibroglia fibrils in the connective tissue stroma.

In addition to the character and arrangement of the nuclei and to the presence of myoglia fibrils, I find another important

difference between myomata and uveal spindle-cell sarcomata. This consists in the fact that myoma cells are truly spindle-shaped whereas the cells of a uveal spindle-cell sarcoma are seldom if ever distinctly spindle-shaped but terminate in or send off laterally several ill-defined irregular processes which anastomose with neighboring cells and thus form a more definite syncytium. This syncytium is most easily recognizable where the cells are cut in cross section. In the case here reported this difference from a sarcoma is very apparent.

An especially noteworthy feature of this tumor is its slight malignancy as evidenced by the following facts:

1. That although a large portion of the growth was left in the anterior chamber at the first operation, it did not increase appreciably in size for a period of sixteen years. It is remarkable that the tumor remained alive in spite of the fact that its connection with the iris was completely severed. Its new blood vessels were evidently derived, not from the ciliary body, but from new tissue formed at the site of the operative wound. The dissemination of the tumor in the form of small nodules on the surface of the iris did not necessarily indicate malignancy, since this probably resulted from the operative traumatism.

2. That the original tumor arose from the surface of the iris by a small constricted base. This seems to be a point of difference from sarcomata that may prove of clinical value.

3. That the original tumor had not invaded the iris stroma.

4. That the tumor showed no mitosis.

6. That after sixteen years the tumor had not involved the structure at the filtration angle. This is in marked contrast to sarcomata of the iris which, under similar conditions, invade the ligamentum pectinatum and canal of Schlemm and extend along the emissary veins of the latter.

In a normal eye smooth muscle is derived from the pigment epithelium of the iris as in the case of the dilatator and sphincter pupillæ, or from the uveal stroma as in the case of the ciliary muscle. The question therefore arises as to whether the tumor in the present case was epiblastic or mesoblastic in origin. Since the tumor arose from the anterior surface of the iris near its root, was entirely unpigmented, and was nowhere connected with the iris muscles or pigment epithelium, it

seems likely that it originated from stroma cells of the embryonic uvea, possibly from misplaced cells which ordinarily would have taken part in the formation of the ciliary muscle.

In regard to the question as to whether any of the tumors previously described as myomata of the iris or ciliary body were really such, it is impossible, in the absence of differential staining, to arrive at a positive conclusion. It is reasonably certain, however, that the tumor described by Thompson and examined microscopically by Griffith was a true myoma. The spindle-cells were arranged in bundles and possessed rod-shaped nuclei. While many such nuclei may often be found in spindle-cell sarcomata, the nuclei are not predominatingly rod-shaped. In addition to this, the illustration of this tumor shows that there was a definite tendency for the nuclei to be arranged in rows leaving zones free from nuclei. There is some probability that the tumor described by Van Duyse was also a myoma of the iris, owing to its long duration, 20 years, and to its not having produced glaucoma or affected vision. From the meager histological description of this tumor, however, it cannot be differentiated from a spindle-cell sarcoma.

Owing to the fact that the ciliary body consists largely of smooth muscle, it would seem that a myoma, was more likely to occur here than in the iris. In none of the six cases of supposed myoma of the ciliary body reported, however, is it possible from the histological description given, to be reasonably sure that the tumor was not a spindle-cell sarcoma. In fact, I regard it as almost certain that the tumors were all spindle-cell sarcomata.

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REPORT OF A CASE OF AMAUROTIC FAMILY
IDIOCY IN AN INFANT OF NON-JEWISH
PARENTAGE.¹

BY DR. MARTIN COHEN, NEW YORK CITY.

IN the year 1881, Warren Tay (1), an English oculist, presented to the Ophthalmological Society of the United Kingdom, a twelve-months old child who displayed "symmetrical changes in the region of the yellow spot in each eye." Tay stated that the child had been brought to his clinic because of a gradually increasing muscular weakness, first noticed when only two or three weeks old. Because he believed the cerebral development to be insufficient, Tay examined the eyes with the ophthalmoscope to ascertain if there was any affection of the optic nerve, which resulted in the findings which he called to the attention of the Society.

This is apparently the first case of amaurotic family idiocy to be placed on record. Three years later Tay reported two more cases occurring in the same family, and the next year a fourth case, in another family. The mother of this last infant stated that an older child had died at the age of fifteen months, after developing similar symptoms. All these infants were males, the offspring of Jewish parents.

In 1885 Goldzieher (2) of Buda-Pesth and Magnus of Breslau each reported a case, but the most important contribution to the history of this obscure disease concerned a case which occurred in this year, but was not fully reported until two years later. This patient was first seen by Herman Knapp of New York when four months old. She died at the

¹ Read before Section on Ophthalmology, New York Academy of Medicine, November 20, 1922.

age of two years, and an autopsy was performed by Bernard Sachs, who reported his findings in a comprehensive paper, entitled *Arrested Cerebral Development*. The chief pathological change consisted in an atrophy of the cerebral convolutions, with marked alterations in the shape and appearance of the large and small pyramidal cells of the cortex. The spinal cord and eyes were not examined. In 1898, Ward A. Holden (11) published a report on the microscopical eye-examination of Dr. Hirsch's case, which is an important contribution to this subject.

Sachs (3) at the time he published his account, was unaware of the earlier work done by Tay. He gave the designation *Amaurotic Family Idiocy* to the symptom-complex which he described, the eye-findings which had been Tay's chief interest being but one manifestation of the condition. Sachs was the first to recognize the familial element in the disease, and in his later publication (1910) made the statement that "the infantile form invariably occurs among Hebrews and among them only"; a peculiar circumstance apparently first noted by Carter (4) sixteen years before.

The priority of Tay's observation and the investigations of Sachs were recognized by Higier (5) who called the condition *Tay-Sachs' disease*, the name by which it is still frequently designated. The recognized symptom-complex at this time was the *familial* factor especially, associated with the eye-findings—"cherry-red" spot at the macula—the progressive mental impairment, the occurrence of the condition solely among children of Jewish parentage, and the period of life at which the disease began—from the third to the sixth month—making it peculiar to infants.

Up to 1917, about one hundred cases of *infantile* amaurotic family idiocy had been reported in the literature. In 1905, however, Vogt, Spielmeyer and others described a familial disease which clinically and in its histology and pathology closely resembled the condition described by Tay and Sachs, but differed from it, in that the symptom-complex was not manifested until the patient was past infancy, and that he often lived for a number of years, and also that the victims were not confined to Hebrews, very few of the cases reported being those of Jewish children. This was called the *juvenile*

type of amaurotic family idiocy to distinguish it from the infantile, peculiar to the first year of life, and as more cases came under observation the term *dementia* was often substituted for *idiocy*, as more precisely describing the character of the cerebral changes.

It is not my purpose here to discuss the relationship between the infantile and juvenile types of Tay-Sachs' disease. Torrence (6) a Glasgow physician, has discussed this relationship at much length in a recently published article, and comes to the conclusion that the two types cannot be sharply differentiated, the same family sometimes producing both types in different individual members. In particular he considers the positive assertion made by Sachs that the infantile type *invariably* occurs among Hebrews while a great majority of the reported cases of the juvenile type occur among non-Jewish children, thus making occurrence among Jewish children one essential factor in the diagnosis of true infantile amaurotic family idiocy. In opposition to Sachs' assertion Torrence cites a well-authenticated case of a non-Jewish infant who presented the symptom-complex of infantile Tay-Sachs disease. Several modern textbooks on pediatrics, as for example, that of Ashby and Wright, and Feer, agree with Sachs' viewpoint, as do also those on ophthalmology, Parsons, Graefe-Saemisch and Knapp.

Falkenheim (7), in a review of this subject in 1901, mentions that from a record of thirty-six families, four cases occurred in Gentiles. These cases, however, have not been verified by authorities according to the reports in the literature. Dr. Heveroch, in the *Neurologischer Centralblatt* of 1904, quoted eighty-six cases of amaurotic family idiocy of which forty-four came from America. Of these, sixty-one are reported as occurring in Jewish children, seven in non-Jews and seventeen no denomination mentioned. Dr. Aperts, in the *Handbuch der inneren Medicin (Erkrankung der Nerven System, 1912)*, quoted one hundred and six cases of amaurotic family idiocy, only two of which occurred in non-Jews. Whether these latter reports included only infantile types is not stated.

Since Falkenheim's review in 1901 mentioned above, I have been able to collect from the literature only two cases of infantile amaurotic family idiocy in non-Jewish families. Cock-

ayne and Attlee (9) in 1914 reported before the Royal Society of Medicine, the case of a child aged one year. The parents were English, and first cousins. The members of the society who heard the report declared this to be a typical case of infantile amaurotic family idiocy "of the Jewish type," the condition described being identical with Tay's original one. Earl M. Tarr (8) published an article entitled, "A Case of Amaurotic Family Idiocy of non-Jewish Parentage, in the *Louisville Monthly Journal* for May, 1916. This report is from the Infant Hospital (Boston) the eye grounds were examined by Dr. George S. Derby of Boston. The second case (three patients in one family), was reported by Professor V. Starck (10), (Kiel), in the *Monatsschrift für Kinderheilkunde*, 1920. The report in the literature of these two latter cases of infantile amaurotic family idiocy in non-Jewish children speaks for its occurrence despite its rarity, and warrants the report of my case, mainly from the standpoint that it appeared in a child of non-Jewish parents and grandparents.

C. B., an Italian female child aged fourteen months; born in New York City, the parents being both born in Sicily. The grandparents also born in Sicily, were first cousins. This family history was substantiated by a thorough investigation. The father is a laborer. There is no history of lues or tuberculosis in the parents.

The patient was sent by Dr. Magner of Hackensack, New Jersey, to the pediatric service of Dr. La Fêtra at the New York Post-Graduate Hospital on October 25, 1922. The mother has given birth to five children with no abortions nor instrumental deliveries. The first child died at twelve months, the second at fifteen months, the cause of these deaths not being ascertained except that the parents say it was a disease similar to that now suffered by the present sick baby. They also remarked that the physicians in Italy were unable to tell them from just what disease the older babies died. These statements can only be taken as suggestive of the cause of death being amaurotic family idiocy or some allied disease. The third and fourth children, their ages now being five and seven years, are still alive and have always been healthy. The fifth child is considered in our case-report.

The child was delivered normally and breast fed for a year. For four months after weaning, the infant appeared to be perfectly well, like other infants of her age, from in-

formation gained of neighbors and the parents of our patient. The child then gradually became disinterested in her mother and surroundings, could not hold her head steadily nor sit up like other children; she appeared apathetic, was constipated and vomited at times regardless of the food taken; had snuffles, was a mouth-breather and had difficulty in respiration.

Upon admission the child looked pale, was poorly nourished and rachitic and not interested in her surroundings. Her face was expressionless, with broad nose, open mouth and—at times—labored breathing. The head dropped to either side when the body was raised and the child was unable to sit up or talk at the age of fourteen months. The head is of normal size, with the fontanels still open; the axillary and inguinal glands are palpable, there is beading on ribs; the heart and kidneys are normal; the spleen and liver are slightly enlarged; the abdomen pot-bellied; the ears normal, teeth decaying, tonsils enlarged; muscles of extremities of poor tonus and spastic; fists clenched; legs strongly extended; all deep reflexes increased, with no ataxia, no Babinsky nor Koenig signs.

The sound of clapping the hands caused twitching of the child's fingers and toes, but there is no hyperacusis. The skin is pale and loose. The reaction to galvanism and faradism is normal.

The laboratory reports result as follows: Wassermann reaction of blood and spinal fluid negative. Colloidal gold-reaction negative. Urine and differential blood count normal. Von Pirquet test negative. Temperature 97—Pulse 80—Respiration 26—.

On October 28, 1922, the child was taken from the hospital by its parents without the consent of the physician, but is still alive, and under observation though gradually becoming more feeble.

Eye Examination.—Externally the eyes appear normal; there is nystagmus with slow component to left when the head is turned to left; pupils moderately dilated, central equal, react sluggishly to light, and do not fix when a strong light is passed in various directions in front of the eyes. At a re-examination a week later the pupils were still dilated but did not respond to light, the eyes did not fix and vision was apparently *nil*. Fundus examination conducted under mydriasis and with the use of an electric ophthalmoscope was similar and symmetrical in both eyes. Papillæ show temporal pallor at first; later this was complete and sharply outlined, the ganglionic cell degeneration causing a secondary optic atrophy; the macular and perimacular area showing circular and grayish-white, with an ill-defined border;

in the center the fovea showing the characteristic circular cherry-red spot sharply defined in contrast to the surrounding whitish macular area. Retinal blood vessels, normal at first, at a later examination appeared to be slightly contracted. Otherwise the fundi were normal.

From these typical fundus findings, I naturally made the clinical diagnosis of amaurotic family idiocy. Inquiring as I usually do in these cases whether the patient was a Jewish child I was told that it was Italian and non-Jewish. I then asked for the clinical chart and further investigated the correctness of the family history, and was convinced that it was absolutely correct.

Before concluding I wish to mention several points which can be deduced from this report.

1. From a general examination of this patient, and the fact that these symptoms appeared in a non-Jewish infant, *unless* an ophthalmoscopic examination were made, the diagnosis of amaurotic family idiocy might have been missed.

2. Routine examinations of the fundi under a mydriatic and the use of an electric hand-ophthalmoscope are essential for aiding the diagnosis in general nervous diseases of *all* infants.

3. The fundus changes as described in this case substantiated the diagnosis of amaurotic family idiocy, as no other disease presents similar fundus changes, excepting bilateral embolism of the central artery, or hole in the maculæ, which naturally would not be considered in this case.

4. The report of this and other similar cases, should, I believe, change the accepted opinion of most investigators of this subject and also those set forth in recent textbooks, that infantile amaurotic family idiocy occurs exclusively and solely in children of Jewish parentage, although it does occur—according to our present reports—in the great *majority* of cases in Jewish children.

I wish to express my thanks and appreciation to Dr. La Fêtra for referring the case to me, and also to Dr. Magner for the many courtesies extended in permitting me to re-examine this patient.

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TUBERCULOMA OF THE ORBITAL CAVITY. EXHIBITION OF PHOTOGRAPH. LITERATURE.¹

BY DR. DUNBAR ROY, ATLANTA.

(With one illustration on Text-Plate VI.)

IN the last few years ophthalmologists have begun to recognize the importance of tubercular lesions of the eye.

If one will examine the ophthalmic literature for the last ten years he will be surprised at the number of articles dealing with this subject which is decidedly true of our own Transactions.

Most of these clinical reports have presented cases of localized tuberculosis of the conjunctiva, sclera, cornea, iris, choroid and retina, while but few have discussed the rarity of tuberculosis of the orbital contents or even an extension of the tubercular process from the interior of the eye to the surrounding tissues of the orbit.

In the mind of the writer the question of localized tuberculosis of the eye is far from being definitely settled.

Lesions occurring in the eye in conjunction with pulmonary tuberculosis, bone tuberculosis, or general tuberculosis in other parts of the body, where the tubercle bacilli or tissue changes showing a characteristic tuberculous histology by a pathologist eminently qualified to pass judgment on these findings, has an entirely different value as to a positive diagnosis, from the report of cases where the only diagnosis depends upon tuberculin reaction or the empirical qualities of being benefited by tuberculin injections.

In the large majority of cases of ocular tuberculosis, which have been reported, these have been treated for some time

¹ Read before American Ophthalmological Society, Washington, May 1922.

with other remedies both locally and through the system and when the case begins to improve under the injection of some form of tuberculin, we immediately place this case in the category of tuberculosis.

Then again it is strange that one observer should report such a large number of various kinds of ocular tuberculosis when another observer with equally as large clinical material sees so few.

Is this fact due to a faulty diagnosis by so many men who are practicing ophthalmology? The writer does not mean to imply that many of these cases reported are not tubercular but is it not a fact that we are prone to report an obstinate case as one of extreme rarity?

In the majority of observed cases of tuberculosis of the eye the diagnosis has been dependent upon tuberculin reaction since in the majority of cases the lesion was such as to preclude excision for microscopic examination and when we remember that the more certain diagnosis depends upon the injection or implantation of some part of the lesion into the eye or peritoneal cavity of an animal, we are confronted with the rarity of such diagnostic technique.

We look upon the presence of tubercle bacilli as the most certain diagnosis and yet how seldom have these microorganisms been found in a diagnosed localized tubercular process?

Next in importance must be the histologic changes seen under the microscope and here we are confronted with the rarity of such pathologic reports.

Many authorities say that a localized lesion means that there are other tubercular processes in the body, inactive perhaps but with grave possibilities for the future. Here again we may be dealing with uncertain deductions.

The writer does not intend by these remarks to be too incredulous as to the number of cases of ocular tuberculosis which have been reported but he does believe that when a case of this nature is presented the author should have exhausted all known clinical, serological, and histological tests before the same receives the stamp of authenticity.

Recently some very interesting articles have appeared dealing with ocular tuberculosis.

One by F. Schieck in the *Arch. für Ophth.*, June, 1921.

ILLUSTRATING DR. DUNBAR ROY'S ARTICLE ON "TUBERCULOMA OF THE
ORBITAL CAVITY."

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Tuberculoma of the Orbit

In discussing this subject he says that modern methods of examination in all these cases (ocular tuberculosis) will reveal in some part of the body evidences of preëxisting tuberculosis especially in the lymph nodes at the pulmonary hilus. This author distinguishes three different stages of tuberculous infection and tells us that as far as the changes existing in the anterior portion of the eye are concerned one is able to substantiate them in vivo by means of the Gullstrand apparatus. The success or failure of treatment with tuberculin depends upon what stage exists when the treatment begins.

In the Oct., 1921, issue of the *Transaction of the Biological Society of Paris*, L. Carrène also presents a very interesting article on the study of "Ocular Tuberculosis by Complement Deviation." In this article the writer calls attention to the fact that in a suspected case of ocular tuberculosis, syphilis should be absolutely excluded. He also makes the significant statement that ocular tuberculosis is rarely or never primary. It develops either concomitantly with lung, bone or other lesions or in individuals of tuberculous history.

Fuchs says that disseminated tuberculosis of the iris occurs as a form of iritis, that solitary tubercle of the iris as far as he has observed is confined to one eye, usually without iritis but resembling a neoplasm.

Von Graefe described it under the name of granuloma and Fuchs thinks that neoplasm is the correct diagnosis because the tumor keeps steadily enlarging and finally perforating the cornea near its margin and pushes out in the form of an exuberant growth.

Haab was the first to bring proof that these tumors were tubercles.

The only comparatively similar case was the one reported by Hansell in 1900. This was a tumor of the orbit in a girl of 13. It occurred beneath the upper lid and eye-ball. It was partly movable and attached to the roof of the orbit. The movements of the eye-ball were normal. The tumor was finally enucleated, measuring 3cm in length, 1.5cm in breadth and 5cm in thickness. Pathologic examination revealed evidences of the tuberculous origin of the growth. Hansell was unable to find a similar case reported in literature up to this time, 1900.

Investigating the subject further the writer finds that tuberculosis of the external adnexa of the eye and orbital cavity is extremely rare and in most of the cases reported it will be found that the tubercular process originated within the globe and the orbital involvement was secondary.

In my own case the pathologic report shows that the tuberculosis process originated outside of the eye-ball more especially around the optic nerve extending back towards the foramen opticus and that the tuberculomatous growth actually pushed in the posterior chamber of the globe.

As to the probable ætiology of this orbital growth it is difficult to say.

The nasal cavities showed absolutely no pathologic changes nor was there any history of previous nasal trouble.

Negroes are frequently afflicted with chalazia which break down and become infected. In this way there is a possibility of an extension through the lymphatics of a tubercular process.

The writer was unfortunate in not seeing the case until the condition was fully developed as shown in the photograph and where immediate operation was imperative.

CASE HISTORY.—Mary M., colored, age 19, consulted the clinic on Oct. 12, 1902.

Previous history:—Mother and father living. No history of tuberculosis in the family. Had always been strong and healthy. No history of syphilis although such statements are of no value among this race. Never any eye trouble until three months ago when the right eye began to pain a little and the white portion looked red. In a few weeks the eye began to look very prominent. From this time, the eye began to protrude and the sight gradually failed. There was present a membrane in front of the eye which looked like it was filled with water (evidently conjunctival chemosis). Complaints of quite a little pain.

Examination:—Well developed girl with no glandular enlargements or body blemishes. Changes in the right eye-ball and orbital cavity can be readily seen as shown by the accompanying photo. There was intense protrusion of the whole orbital contents. The cornea could be seen. The bulbar conjunctiva was œdematous and thickened and extended far over the cornea besides protruding from the palpebral fissure. Palpation over the upper lid revealed a mass which was evidently filling the orbital cavity. Firm on pressure

and yet showing slight signs of fluctuation. Vision was of course destroyed. The other eye was perfectly normal.

The question of diagnosis was uncertain. The nasal examination was negative and there was no history of previous trouble. Operation was immediately performed by exenterating the orbital cavity without disturbing the lids.

The whole mass with eyeball was removed without difficulty, the optic nerve was severed close to the foramen opticus. The orbital cavity was swabbed with chloride of zinc solution and packed with gauze.

Recovery was uninterrupted. After the pathologist's report the patient was given all the clinical tests for tuberculosis without result.

She was seen two years after the operation and was in perfect health. Since then she has disappeared from observation.

Pathologist's Report:—Dr. John Funke, formerly Prof. of Pathology in Jefferson Medical College, Philadelphia:

"The specimen consists of a nearly globular mass measuring 4 by 3.8 cm and weighing 15 gms. Its external surface is irregular as though dissected from other structures.

Although globular the specimen appears to be composed of two different structures, one a diseased eyeball and another rather firm homogeneous part around the optic nerve.

The greatly altered cornea can be recognized although blurred and only 0.8 cm in diameter. Incision reveals the conjunctiva, retina and posterior chamber; the anterior chamber is obliterated. There is apparently little alteration in the retina, but the conjunctiva is much thickened.

The optic nerve is easily recognized passing through the homogeneous mass already referred to; it is around this nerve that most of the disease has taken place. At the origin and to one side of the optic nerve, the posterior chamber is pushed inward, due to the pressure exerted by the homogeneous mass. The diseased mass is dull, yellowish gray and most abundant midway between the origin of the optic nerve and the foramen. The mass is limited by considerable fibrous tissue which extends forward over the eyeball and to the cornea which structure has been partially obliterated.

Histology:—Section of the optic nerve shows evidence of oedema and considerable round cell infiltration in the sheath.

The mass around the optic nerve is composed in part of a homogeneous acid staining substance around which the tissue shows coagulation in which there are fragments of nuclei and cell detritus. There is considerable infiltration around the area of coagulation necrosis. Some of these cells are very large, have a hyaline acid staining protoplasm and nuclei which stain intensely with the basic dyes and are ar-

ranged around the periphery of the cell. Many of the sections show considerable fibrous tissue and circumscribed areas, the center of which show coagulation necrosis and the periphery composed of an abundant round cell infiltration. Among this cell infiltration there is clearly an effort made to produce fibrous tissue.

Diagnosis:—Chronic caseous tuberculosis.

In reporting the literature bearing upon this subject the writer has utilized only those cases where either an enucleation was performed and a pathologic examination made or where the history of the case was sufficiently uncertain in its diagnosis as to warrant some extended discussion:

Primary tubercle of the bulbar conjunctiva, followed by subacute pulmonary tuberculosis and death. Manuel Marin Amat, *Arch. de oftal. hispano-am.*, 21:233, Madrid, May, 1921.

The patient in this case was a young, robust man, with healthy parentage. During his military service he contracted measles, and two months later complained of a small neoformation of the left eye. This was the size of a pea, round, reddish-violet, very vascular, with a yellowish head. He complained of no pain or malaise except the feeling of a foreign body in the eye. The treatment consisted of lavage of isotonic serum, insufflations of iodoform powder, and, internally, elixir of guaiacol. Wassermann negative. Tuberculin cutireaction, strongly positive. The initial lesion was soon cured, but the patient began to be severely ill, with cough, expectoration, fever and emaciation. With hospital care he recovered sufficiently to rejoin his regiment but died four months later from pulmonary affection. This was evidently a primary lesion of the eye, acquired when in a sensitive state, when convalescent from measles. The infection spread by the lymphatic channels and became generalized. According to the literature, primary tubercle of the conjunctiva is a grave form of infection, with bad prognosis. Diagnostically, it must be differentiated from syphilis, mucous plaques, sporotrichosis and from perikeratitis. The treatment is local and general; surgery is not indicated. Cautery may be used. Tuberculin must be used with caution but is indicated in localized lesions in order to immunize the organism against general infection. It is contra-indicated when there is great weakness, fever or hemoptysis.

A case of suspected solitary tubercular tumor in fundus oculi. Y. Onishi, in *Nippon Gankagakkarasshi*, 18, no. 3:

320-324, 1914; ref. *Ztbl. f. d. ges. Ophthal.* etc. 2:263; Berl. 1920.

Male, 23 years of age, suffering from catarrh of right pulmonary apex, was suddenly affected in July, 1912 with clouding of the lower portion of the visual field in the right eye. Positive Wassermann and Pirquet reactions. By the end of September a yellowish, light red, elliptical tumor had formed closely above the macula lutea. The ensuing ocular change measured 3mm in papillary diameter and lifted up the retina for about 4 diopters. The fovea centralis was surrounded by numerous small white spots forming a starlike figure. Large central scotoma. Treatment with iodide of potassium and by inunction continued for 10 months; gradual reduction of focus with simultaneous improvement in visual acuity from 0.1 to 0.4. Onishi believes this focus to be a solitary tubercle.

Tuberculosis of the choroid. L. Ortin, in *Arch. d. ophthalm. hispan. amer.* 14, no. 163:349-358; Barcelona, 1914.

CASE REPORT.—Boy, 4 years of age; enlargement of right eye so that closure of lids is impossible; no ocular movement possible; eye directed downwards; sight = 0. Bulbous protrusions of sclera; no perforations; iris and crystalline lens normal. Eyeball contains a tumor of the size of a nut; the detached retina covers the tumor. The boy had several severe attacks of pain, and disease had been diagnosed as cysticercus or malignant tumor. After enucleation, the entire vitreous body proved to be one tubercular knob containing a caseous nucleus and numerous epithelioid and giant cells.

Two cases of solitary tuberculosis of the posterior bulbar portion. A. N. Natanson, *II. Klin. Mtsbl. f. Augen*, xlviii, 113-125, Stuttgart, 1910.

CASE REPORTS.—I. Delicate but healthy boy; two years of age; slightly enlarged gland in front of left ear; yellow reflex in left eye.

Clinical ocular findings—left eye: cornea, anterior chamber, iris, crystalline lens, normal; pupil wide and fixed ("lichtstarr"); eye completely insensible ("reizlos") ocular fundus shows yellowish white reflex without special symptoms; increased tension; amaurosis; right eye: normal. Ocular diagnosis—retinal glioma.

Treatment:—enucleation of eyeball and excision of optic nerve almost down to optic foramen; recovery; dismissed 10 days after operation; further postoperative history unknown.

Microscopic findings—normal cornea with a few leucocytes in its posterior surface; central parts of anterior chamber shows normal depth; normal iris adheres peripherally to cornea and displaces angle of ocular chamber; normal crystalline lens; ciliary body slightly atrophic; a strictly defined and typically tubercular node in anterior temporal portion of choroid, rest of choroid to edge of tumor markedly atrophied; nasally 4mm and temporally 6mm from papillary area choroid begins to be uniformly inspissated and transformed into granular tuberculous tissue with epithelial and round cells, numerous giant cells and extended caseation; papilla is supplanted by a caseous tumor; papillary necrosis extends through lamina cribrosa to optic nerve; detached abnormal but non-tuberculous retina adheres centrally to tumor; posterior portion of sclera adheres firmly to tuberculous choroid; near opening of optic nerve the tumor has broken through and invaded the retrobulbar tissue; the excised portion of optic nerve shows necrosis of nerve trunk with tuberculous infiltration of sheath. A similar case is reported by J. Jung in *Arch. f. Ophthal.*, xxxvii, no. 4, 125-158, Leipz., 1891.

Boy, aged 2; scrofulous; yellow reflex in right eye.

Clinical ocular findings—left eye: normal; right eye: insensible; cornea normal; anterior chamber shows normal depth; tension normal; amaurosis; yellow reflex without special symptoms.

Ocular diagnosis:—glioma or pseudo-glioma; enucleation proposed but refused.

Clinical ocular findings two months later—right eye: both lids swollen; eye enlarged and protruding; slight clouding of cornea; shallow anterior chamber, iris tinged green; posterior synechia cause irregular pupil; pupil filled with exudate, tension probably slightly increased; ocular conjunctiva protrudes temporally at some mm from limbus; at tip of protrusion there is a perforation admitting the probe to the ocular cavity.

Ocular diagnosis—intraocular tuberculosis, enucleation advised; at operation the ocular conjunctiva surrounding the perforation is left in place though a quantity of caseous matter is voided; the optical nerve is normal at the place of incision.

Postoperative history:—1 week after enucleation pneumonia set in; tuberculosis suspected and boy transferred to children's hospital; later history unknown.

Microscopic findings:—middle and deep cornea layers show diffuse small cell infiltration; hemorrhagic exudate in anterior chamber; hyperæmic iris with round cell infiltration; pupil filled with fibrinous exudate; pupillary edges adhering to

anterior surface of crystalline lens; ciliary body and posterior chamber transformed into tuberculous granular tissue completely walling in the crystalline lens; complete destruction of choroid, retina, lamina elastica chorioidea; the whole eye is filled with granulations containing round, epithelial and giant cells, many large tuberculous nodes with *rather few tubercle bacilli*. The center of the granulations is formed by a caseous focus; tuberculous granulations invade all layers of the sclera, infiltrate the ocular conjunctiva covering the sclera and extend through the papilla to the lamina cribrosa.

Tuberculous panophthalmia after confinement. M. Kellermann, in *Zrschr. f. Augenhkl.*, xx, no. 5, 464-467; Berlin, 1908.

CASE REPORT.—July, 1907, admitted to Eye Clinic; married woman; aged 26; two healthy children; last normal confinement two months ago; two weeks after confinement inflammation of right eye set in; no trauma; swelling of lid and pus formation; swelling progressed gradually; rapid loss of visual acuity; no medical advice sought before admittance to clinic.

Clinical findings:—general examination negative; left eye; normal; right eye: marked œdema of conjunctiva; slight secretion; two scleral perforations near and just posterior to insertions of superior and external recti perforations are as large as peas and yellow particles protrude therefrom; cornea absolutely clouded; no light reflex.

Bacteriologic findings:—secretion and chipped off necrosed particles negative.

Diagnosis made:—postpuerperal metastasis of apparently unknown ætiology.

Treatment:—enucleation of eyeball.

Microscopic findings:—numerous round cells, enlarged capillaries, leucocytes with lobular nucleus in conjunctiva; anterior chamber filled with fibrinous and granular tissue; sclera abnormally inspissated, with blood pigment between the individual lamellæ; perforations are bordered with granular tissue; cornea shows diffuse infiltration with various leucocyte cell types, no epithelial defect, no symptoms of past or present ulceration; iris and ciliary body are unrecognizable, four times their original thickness and transformed into granulations; crystalline lens cataractous; vitreous body, choroid, retina, and anterior uveal tract are transformed beyond identification and supplanted by granular tissue.

Histologic findings:—no leucocyte infiltration except in cornea and sclera; with the exception of the change in the crystalline lens the entire eyeball is one *giant tuberculous*

conglomeration perforating the thickened capsule of the eye in two places.

A similar case has been reported by De Lieto-Vollare, *Lav. d. Clin. ocul. d. R. Univ. di Napoli.*, v, 1897; in Lieto's case the retina also was slightly involved in the tuberculous process, and the course of the disease was sub-acute.

Primary tuberculosis of bulbar conjunctiva. W. Reis, in *Kl. Mtsbl. f. Augenhk.*, xlv, 158-170; Stuttgart, 1907. Ten cases only reported in literature to 1904.

Case histories reported by:

W. Reis: Girl, 16 years of age; general history negative; in fall of 1905 right eye shows reddening of nasal portion, somewhat later a small tumor develops and gradually grows; April, 1906, admittance to hospital.

Clinical findings:—general examination negative; no enlargement of lymph glands; right eye: tumor, size of a pea, in nasal portion of bulbar conjunctiva; basis of tumor fuses into surrounding sclera; ocular conjunctiva covering tumor is flexible and locally markedly infused with blood.

Treatment:—medical at first, then enucleation of tumor; base of tumor was found to be so intimately fused with the scleral wall that tumor was cut from its base to prevent injury of the eyeball; at the insertion of the internal rectus reddish gray gelatinous matter was found; wound sutured.

Postoperative findings—at end of April wound healed; at nasal end of bulbar conjunctiva painless, rosy, thick tumor, $1\frac{1}{2}$ cm at base; yellowish nodes scattered over surface of tumor; near limbus tumor shows operative scars; normal cornea and iris; crystalline lens transparent; visual acuity diminished to $\frac{1}{8}$; pupil regularly enlarges after atropine instillation; vitreous body shows numerous uniform cloudings, papilla of optic nerve slightly hyperæmic; no changes in ocular fundus.

Histologic findings:—tumor sections show typical structure of tuberculous nodes with caseous foci.

Animal experiment made:—yellow node of bulbar conjunctiva excised and *intra-peritoneally injected* into guinea pig; animal killed later; tuberculosis of mesenteric lymph glands and pseudo tuberculosis of spleen diagnosed at autopsy.

Tuberculin test:—made May, 12; injection of 1 mg. "old Koch tuberculin"; general reaction; normal temperature fluctuations between 36.6 degrees and 37 degrees; after injection, evening temperature rose to 39 degrees and decreased gradually; specific ocular reaction; reddening and swelling of bulbar conjunctiva, hyperæmia of palpebral conjunctiva; palpebral fissure of right eye stuck together on next morning.

Walb—first case reported in literature; published in *Kl. Mtschr. f. Augenhlk.*, 1875. Case history:—young boy; scrofulous; caries of temporal bone with lymphomata colli; ocular findings: irregular conjunctival tumor in upper quadrant of bulbar equator; pathologic findings: tuberculous tissue; complications; panophthalmitis.

Wagenmann—reported in *Arch. f. Ophth.*, 1888.

CASE HISTORY.—Male, age 34; pulmonary tuberculosis; tumor, size of a pea, in lower inner quadrant near limbus; bacteriologic findings: tubercle bacilli; complications: peripheral clouding of crystalline lens; recovery after 5 months; 6 months later death from pulmonary tuberculosis.

Griffith—reported in Nagel's *Jahresber.*, 1889.

CASE HISTORY.—Boy, age 4; lymphomata colli; ocular findings: thick elevation near limbus; pathologic findings: tuberculous tissue; complication; palpebral lupus; recovery after five months.

Rieke—reported in *Arch. f. Augenhlk.*, 1891.

CASE HISTORY.—Male, age 73, costal caries; ocular finding; tumor, size of pea, outside of limbus; bacteriologic finding negative; pathologic findings; tuberculous tissues; complication: tuberculosis of iris; later history unknown.

Moauero—reported in *Atti d. Acad. med. di Napoli*, 1897; cited by Saemisch in *Hdb. d. ges. Augenhlk.*, v, 1904.

Case history not given.

Uhthoff—reported in *Berl. Kl. W.*, 1900.

CASE HISTORY.—Girl, age 15; tuberculosis of nasal sinuses; ocular finding: round tumor, 1cm diameter, in lower inner quadrant adjoining limbus; pathologic finding; tuberculous tissue; positive tuberculin reaction; later history unknown.

Bossalino—reported in *Ann. di Ottalm.*, 1901.

CASE HISTORY.—Girl, age 7; general examination negative; ocular finding: diffuse tumor, 4mm, thick, near outer limbus; pathologic finding: tuberculous tissue; no recurrence after seven months.

Puccioni—reported in *Ann. di Ottalm.*, 1902.

CASE HISTORY.—Boy, age 8; general examination negative; ocular finding: round tumor, size of pea, at insertion of external rectus; bacteriologic finding: tubercle bacilli; pathologic finding: tuberculous tissue; no recurrence.

Chevallieran and Chaillous—reported in *Cong. d. l. Soc. franc. d' Ophth.*, 1904.

CASE HISTORY.—Male, aged 40; chronic bronchitis and testicular tuberculosis; ocular finding: thickened bulbar conjunctiva walls in entire limbus; bacteriologic finding: positive inoculation of rabbit results in peritoneal and iris tuberculosis; pathologic finding: diffuse infiltration without typical tubercular structure; later history unknown.

Lafon—reported in *Thèse de Bordeaux*, 1904.

CASE HISTORY.—Woman, age 22; tumor albus cubiti; ocular finding: tumor, 8mm wide, 6mm high, on temporal side of limbus and invading cornea; pathologic findings: fibromyxoma telangioma; recurrent tumor shows some caseous foci and giant cells; complication: punctate cataract; recurrent tumor four months later, also tumor albus carpi.

Solitary tuberculous tumor in papillary region of optic nerve: P. Verderame, *Klin. Mtsbl. f. Augenhlk.*, xlv, 401-416, Stuttgart, 1908.

CASE REPORT.—Married woman; age 36; family history negative; right pleurisy with liquid effusion for five weeks; slight reddening of left eye previous to pleuritic attack; intense reddening and swelling of left eye since pleurisy; amaurosis; intense bulbar pain.

Clinical findings:—June 30 normal right eye: sight $\frac{1}{2}$ E; left eye: marked ciliary oedema; hyphemia of anterior chamber; plastic iris; gray reflex in fundus oculi; T. \div 1; eyeball painful to touch; LS = 0; intense pain.

Treatment—pressure bandage; pain and tension diminished; July, 19 violent pains, eyeball enucleated in narcosis; marked hemorrhage into orbital tissue; July 29, complete palpebral ptosis; Aug. 2, faradisation; Sept. 11, no ptosis, palpebral levator functions normally.

Microscopic findings—tumor consists of *typical tubercles*; the detached retina adheres slightly here and there to the choroid, these adhesions prove to be chorio-retinal foci; posterior chamber and ciliary process are filled with fibrinous exudate; atrophic iris adheres with pupillary edge to anterior surface of crystalline lens, rest of iris protrudes; choroid shows thick diffuse infiltration throughout, numerous scattered Langhan's giant cells surrounded by epithelioid cells; suprachorioidal tissue shows thick nests of lymphocytes; pupillary area shows crater formation, filled with exudate containing detached pigment cells and detritus; at one place near the adhesion of capsule and pupillary edge there is a giant cell containing numerous irregularly distributed nuclei and pigment atoms; surface layers of

crystalline lens shows extensive decay; corneal endothelium is partially defective; anterior surface of cornea shows scattered lymphocytes; conjunctival portions of tumor show lymph vessels filled with leucocytes and numerous obliterated capillaries.

A rare case of epibulbar tuberculosis, R. Bergmeister, *Wien. m. W.*, lxxi, No. 24, 1045-1049, June, 1921

Bergmeister reports that anatomical findings of an enucleated eyeball from a man, 33 years of age, who was affected for years with recurrent "scrofulous" corneal and conjunctival inflammations. The eyeball showed superficial and deep corneal cloudings and 2 yellowish tumors about as large as half a lentil. Wassermann reaction negative; swollen glands in neck and axilla; former bilateral catarrh of pulmonary apex

Microscopic findings—complete scleral necrosis at site of tumors; conjunctival oedema; infiltration of lymphocytes, plasma cells, scattered typical non-vascularized tuberculous nodes with giant cells; also conglomerate tubercles; this infiltration spreads subepithelially deeply into the cornea, the canthus, into the anterior chamber along the pectinate ligaments and between the tissue of the iris.

Necrosis of the sclera is supposed to be due in this case to repeated tuberculin treatments causing excessive increase in antibody formation; oedema and partial necrosis of single retinal layers is said to be the effect of toxins.

THERAPEUTIC USE OF WEAK ATROPINE SOLUTION IN ASTHENOPIA.

BY DR. WILLIAM E. GAMBLE, CHICAGO.

EYE-ACHE and headache resulting from induced spasm of the sphincter iridis and ciliary muscle by the instillation of eserine is an everyday observation in our work, usually the discomfort being relatively slight; but in some cases much pain is produced. Recently one instillation of a $\frac{1}{4}\%$ solution of eserine in the eye of a physician produced so much eye pain that he had to be sent home in a cab and did not recover from the pain until the next morning. Part of our discomfort experienced in passing from a dark room into bright daylight is produced by the rapidly contracting pupils.

While with properly fitting glasses most persons can endure the accommodative spasm of their ciliary muscle in doing close work with but little pain or fatigue, there seems to be an increasing number of those who cannot.

I think you will agree with me that the rational treatment in these cases is to give less work to the tired eyes, to increase the nutrition of the patient and otherwise build up the general health. Unfortunately, many of them cannot quit work. Temporary rest may be given by instilling a high dilution of atropine which should not dilate the pupil enough to annoy the patient and should not interfere with close work. I have found $\frac{1}{200}$ of a grain of sulphate of atropine to an ounce of water dropped into the eye Saturday afternoons, for those who are doing close work the rest of the week, to give much relief.

If used oftener, the results are better.

I herewith narrate the history of three illustrative cases.

CASE I.—Mr. C. A. T., minister, 35 years of age. Came to me first in 1900. Said he had had sick headache as a child

which had continued up to that time at intervals of two to three weeks. He came to me especially on account of a "gripping feeling in his eyes when he did close work." He had worn glasses all his life without relief from this symptom. Had had to give up preaching two years before for six months. I fitted his eyes with proper lenses without any improvement in this pain in his eyes; finally as a last resort I prescribed atropine sulphate $\frac{1}{10}$ grain in an ounce of water. One and one-half years later he reported that he had used the solution continuously since seeing me, once or twice a week with relief from the "gripping" of his eyes. Later he reported that he could not use it that often as it had begun to produce irritation of the eyes. Finally he gave up preaching and went to farming, which cured him. The exaggerated contraction of the pupil in this case suggested to me the use of atropine.

CASE 2.—Miss L. T., aged 24 years. Referred to me by Dr. Henry L. Baker of Chicago. The patient is a seed analyst, using the microscope almost continuously during the day. She complained to me of eye fatigue. Could read only a few minutes without pain.

The correction of a small degree of myopia had no effect upon this symptom. Atropine solution was prescribed.

Six months later she reported that she had used the solution once daily with relief from the headache and that the medicine did not interfere with close work.

Advising her that the drug was not intended to be used indefinitely; but simply to tide her over the bad spells, I prescribed a pint of cream daily in addition to her other meals. A few months later she reported that she had gained ten pounds and could get along without the atropine.

CASE 3.—Oct. 27, 1904, Mrs. A. C. M., 30 years of age, referred by Dr. A. C. McIntyre, of Mendota, Ill. Complained of extreme photophobia and also of being unable to use her eyes in close work. She wore the proper lenses made of Crooks, noviol and other colored glass with but little relief.

I noticed in this patient also, the exaggerated contraction of the pupil on allowing light to enter the eye, and prescribed atropine sulphate. She reported to me a few months later that she had great relief by using this solution once or twice a week. She had seldom to use it three times.

Her pupil during this time was always larger than normal yet she evidently did not experience much discomfort from this dilatation.

It is not my claim that this treatment is anything but a stopgap until change of conditions or general treatment gives relief. I am not sure but that in many cases an even weaker solution might be indicated. In some cases a $\frac{1}{10}$ gr. solution was necessary to give relief. The strength and frequency of its use varies in different individuals. This particular solution is offered as a guide. Carelessness in filling the prescription should be carefully guarded against.

It would seem that the use of it is indicated more particularly between the ages of 18 and 35 years. In younger persons the stress and strain of life has not yet produced neuroses: in the older, the pupil becomes more sluggish with advancing years and the accommodation less, with the increasing sclerosis of the lens.

I am of the opinion that in many hysterical patients, the photophobia is of the trigeminal and not of the retinal type. The mechanical pressure on the nerve endings in and about the sphincter iridis is the source of the discomfort.

It is rare, in my experience to have seen indications for the use of this solution in men; practically all of the patients have been young women.

I am reporting my experience with this drug, hoping that indications for its use will be more carefully worked out by others than I have been able to do.

OIL CYST OF ORBIT.¹

REMOVED BY KRONLEIN'S OPERATION.

By DR. ARNOLD KNAPP, NEW YORK.

THE patient, referred to me by the courtesy of Dr. Hiram Woods of Baltimore, was a young woman 27 years of age who had had a protruding right eye for many years. The prominence had increased during the past year; it varied, and when marked was associated with pain in the eyes. The eyeball was normal and the eye was pushed straight forward. The vision in the affected eye was $\frac{3}{8}$. The exophthalmometer gave: Right, 26; left $17\frac{1}{2}$. Motility of the eye was unimpaired. No change in exophthalmos on bending forward. The upper lid covered the upper third of the cornea; the lower lid was retracted exposing $3\frac{1}{2}mm$ of conjunctiva below the cornea. The scleral conjunctiva on the outer half of the eyeball was of a peculiar yellow color and congested. A firm mass was felt on palpation within the outer orbital margin. A definite diagnosis was not made and an exploratory operation was determined upon.

OPERATION Nov. 6, '20. Ether anæsthesia. After reflection of the soft parts externally, the bone was easily divided with the Hartley-Kenyon electric saw, with the kind assistance of Dr. J. H. Kenyon. The bone wedge was completed with a thin osteotome and mallet. On retracting the bone flap, the periosteum of the orbit was found uniformly bulging and tense. A horizontal incision was made in the periosteum, with an immediate escape of clear, oily fluid. On enlarging the incision more oily fluid, together with white sebaceous material, was obtained. The cavity presented a smooth and pink inner wall and extended from the conjunctiva back to the apex of the orbit. The sack wall proved so thin that it was very difficult to dissect it and some

¹ Read before American Ophthalmological Society, Washington, May 1, 1922.

had to be left behind. It appeared adherent in front to the region of the lacrimal gland. The external rectus was not encountered. Flap replaced; wound and eyelids sutured. Nov. 22, '20: the wound had healed by primary intention. There was some oedema of the upper lid. Nov. 27, '20: swelling of upper lid less. Vision normal. Exophthalmometer: Right 19; left 17. Motility normal. No diplopia. April 12, '21: there was a definite mass of thickened tissue to be felt under the outer margin of the orbit above the ligament. The conjunctiva presented a yellowish discoloration. The cosmetic result was satisfactory.

Microscopical examination: The cyst wall was composed of thin connective tissue without any papillary projections, an inner lining of several thicknesses of epithelial cells and keratin. The cyst wall contained very many sebaceous glands and a few hair follicles; in the surrounding tissues many dilated venules.

The oily fluids and solid material was examined by Dr. Theodore F. Zucker, of the Pathological Laboratory of the College of Physicians and Surgeons, who reported as follows:

"The oil contains no free fatty acids. It contains 36.2% of cholesterol and has an iodine number of 124. This would seem to indicate that it consists mostly of a triglycerid of a fatty acid, more unsaturated than oleic, the iodine number of the cholesterol being 56. It would seem that a fatty acid of iodine number about 180 were involved. While this oil was entirely soluble in fat contents, the solid material was not. The solid material contains 72% of cholesterol and gave an iodine number of 55. The alcohol insoluble portion was probably protein. It would seem then that while the oil is a triglycerid holding in solution 32% of cholesterol, the solid material is mostly solid cholesterol, containing as impurities some protein and very little of the oil."

Oil cysts of the orbit belong to the group of dermoid tumors, the proportion of oil contents depending on the preponderance of sebaceous glands. Lagrange states that their site of predilection is in the prelacrimal region. In these oil cysts the oil is the direct product of the sebaceous glands. Some atheromatous material is always present in the depths of the cyst. The oil is either very yellow, rich in oleates, or very white like glycerine, composed of stearates and glycerites. The unusual features in this case were the yellowish discoloration of the conjunctiva over the tumor and the extreme thinness of the tumor wall. The yellow color of the conjunctiva was of the same

color as the oily contents and was undoubtedly derived from it. The walls of dermoid tumors are usually thick and the dissection is, therefore, not difficult.

In the performance of the osteo-plastic resection of the outer orbital wall I want to point out the advantages of dividing the bone externally with the Hartley-Kenyon electric saw,¹ which consists in an electric motor held in the hand, to which the saw is directly attached. By protecting the orbital periosteum and soft parts by suitable retractors, the upper and lower section through the superficial anterior part of the outer wall of the orbit is quickly made; the wedge of the bone is then completed with an osteotome and the flap reflected back. The opening in the bony outer wall is then enlarged in the depth by a rongeur forceps, making a good exposure of the orbital cavity. After completion of the operation the bone flap is replaced and fits accurately and can be firmly wedged in place; healing takes place without deformity.

¹ *Annals of Surgery*, April, 1907.

BLOCKING THE MAIN TRUNK OF THE FACIAL NERVE IN CATARACT OPERATIONS

By MAJOR R. E. WRIGHT, I.M.S., MADRAS, INDIA.

SEVERAL methods have been described for partially blocking the facial nerve and controlling the orbicularis. The method adopted in this hospital was described in the *American Journal of Ophthalmology*, June, 1921. It is very similar to the methods described by Van Lint and Villard, differing only in that the nerve fibres are blocked nearer the main trunk. It is most useful when carefully performed, but a more complete effect is frequently desired. It has, no doubt, occurred to numbers of ophthalmic surgeons that blocking of the main trunk of the facial as it leaves the skull would be the surest means of securing complete muscular flaccidity. I do not know whether such a procedure has been described. However this may be, during the past year I attempted in a number of cases to cause temporary blocking of the nerve near the stylo-mastoid foramen in its extra cranial course, using 2% novocaine in varying quantities from $\frac{1}{2}$ to 2cc. Two routes were chosen: in the first the needle was passed from below upwards and inwards along the anterior face of the mastoid process towards the stylo-mastoid foramen until it abutted on the bone close the foramen or actually touched the nerve; in the second the needle was passed horizontally inwards and backwards just in front of the mastoid process and immediately below the bony external meatus. In the majority of cases the result was negative. In the few where it succeeded, the paralysis set in within 15 minutes of the injection and persisted for upwards of an hour when signs of recovery set in. The paralysis was absolutely complete and it was most satisfactory to

operate under such conditions. Pending investigation with a view to finding exact anatomical guides which will lead to a sufficient success rate, to make the above method practically useful, an attempt was made to inject the parotid gland itself where the nerve begins to split up into its original branches. This did not give nearly such complete or lengthy paralysis. The onset was inside ten minutes and the duration not more than twenty. The successful cases in which the trunk of the nerve was blocked illustrate the possibility of obtaining transient but complete facial paralysis which is of the greatest value in certain cataract cases. It remains to be seen whether one can lay down definite instructions for finding the trunk with practical certainty. This note is published in the hope that others may try to render the procedure so easy as to be available to any surgeon who wishes to perform a cataract operation with complete relaxation of the facial muscles established. I have to thank Mr. P. M. Sridharan of my staff for assisting me in preliminary anatomical investigations.

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REPORT OF A CASE OF MELANOSARCOMA OF THE CONJUNCTIVA.

By DR. ANTONIO S. FERNANDO, MANILA.

(With two illustrations on Text-Plate VII.)

I WAS prompted to report this case for in the first place I consider it a rare affection, and in the second, I hope that what had happened to this patient may serve as a lesson to any physician who may handle a similar case.

V. M., of San José, Batangas, a Filipino woman, 37 years old, with dark complexion, was admitted to the Philippine General Hospital on March 27, 1921, with a pedunculated black tumor in the conjunctiva of the right eye. It started about two months before admission as a small mass in the limbus of the right eye, growing rapidly, but causing no pain nor any inflammation. The palpebral fissure appears almost closed when looking straight at the patient, because the upper lid covers completely the growth, this causing a bulging of the lid at the center. (See Fig. 1.) To expose the growth the upper eyelid has to be raised up and brought on top of the mass. This is rather soft, black, projecting from the surface of the eyeball at the region of the limbus. (See Fig. 2.) The growth is pedunculated but with a broad attachment. It measures about 2cm in its largest diameter, is irregularly shaped but with smooth surface. The cornea, pupil, iris, and fundus are normal. Vision is impaired only because the mass overhangs the cornea. She does not give any history of bleeding while in her home but here in the hospital it bled once due to slight trauma.

The growth was excised, but as the black pigment had infiltrated a rather large area of the conjunctiva, portions of it were left intact. The wound was sutured, and healed up by first intention. Section from the growth was diagnosed as melanosa sarcoma by the pathologist (Dr. Miguela G. Baltazar).

As vision was only slightly defective, the patient refused enucleation of the eyeball. She was discharged eleven days after the operation with healed up wound, smooth conjunc-

ILLUSTRATING DR. ANTONIO S. FERNANDO'S ARTICLE ON "MELANOSARCOMA OF THE CONJUNCTIVA."

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FIG. 1

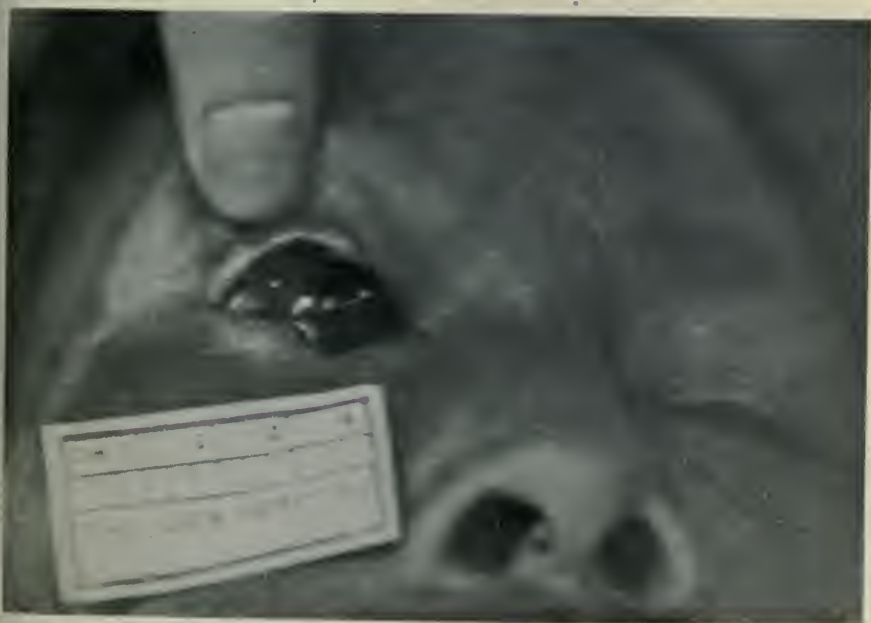


FIG. 2

tiva, but with portions deeply pigmented which could not be removed. The eye was not exposed to X-ray at all.

On January 16, 1922, about two years later, she came back to this hospital and was admitted to the medical department (by mistake) for generalized tumor masses in the skin, headache, dizziness, and ascites. The first swelling appeared just above the left breast about four months before this second admission, rapidly increasing in size. A few weeks later, similar swellings had appeared practically all over the body, and shortly after the abdomen became big and distended with fluid.

On admission there were found numerous nodular swellings, firm in consistency, not tender, varying in size from pea-size to two inches in diameter. The growths were subcutaneous and moveable, and were distributed all over the chest, trunk, and extremities, but there was no recurrence of the tumor mass in the eyeball, the conjunctiva remaining black as when discharged and vision remained the same.

Drs. C. B. Lara and A. B. M. Sison of the Medical Department, under whose immediate care the patient was in this second admission, had requested a section from the tumor just above the left breast, and the pathologists (Drs. Ernest Goodpasture and Eloy Pineda) reported "melanotic sarcoma."

The patient stayed ten days only in the hospital. While here she used to complain of severe headache, abdominal pain, dizziness, increasing ascites, and rapid emaciation, all of which could be explained by the metastases to internal organs. She was discharged with the advice to the family that the case was hopeless.

CONCLUSION.—In spite of its benign appearance, this tumor is malignant, and therefore, it is essential to extirpate the growth at the earliest possible moment, and if necessary, as it was in this case, to resort to enucleation even if the vision is not at all defective. In this case there has been no recurrence of the tumor mass in the eyeball, but rapid metastases had developed just the same.

You are all aware, however, how hard it is to persuade a very ignorant patient to have the eye enucleated even if it is greatly inflamed or already blind. We have had several cases of this experience among our laity. Knowing this you will not be surprised if we had failed to persuade this patient to consent to enucleation, and thus avoid a very unfortunate thing—the development of the metastatic growths.

A BRIEF CLINICAL SURVEY OF CASES IN THE FREE DISPENSARY OF THE PHILIPPINE GENERAL HOSPITAL.¹

BY DR. ANTONIO S. FERNANDO, ASSISTANT, DEPARTMENT OF OPHTHALMOLOGY AND OTO-RHINOLARYNGOLOGY, COLLEGE OF MEDICINE AND SURGERY, U.P.

MY object in presenting this paper to you to-night is to give some idea of the relative distribution of the common diseases of the eye, in our free dispensary, and also to state briefly some of my clinical observations on them.

A knowledge of this sort, I believe, will be of great help not only to the young specialist but also to the general practitioner here in Manila. As yet, there has not been published in the Philippines any clinical survey or statistical studies on eye diseases, and, consequently, the new practitioner has to depend largely upon statistics compiled in foreign countries where climatic conditions, mode of living, and even degree of education of the masses and other factors which influence the diseases, are different from what we find here.

Our free dispensary offers a very rich field for investigations of this nature. Indeed I consider this the best place at present in the whole Islands for research of this kind. Besides the ordinary facilities for diagnosis provided for in our dispensary clinic, such as a good refraction room, an adequate dark room, and other facilities, we have free access to the hospital laboratories, namely, the clinical and X-ray, whose staffs coöperate with us in making our diagnosis. Difficult cases are, as a rule, admitted to the wards for further study and proper diagnosis.

¹ Read before the Manila Medical Society, Dec. 12, 1921.

In the dispensary we come across all kinds of cases ranging from the very mild or incipient to the very advanced. In the hospital proper, we do not get these cases, inasmuch as those admitted are in the great majority of cases for operation only. We fail to see there cases which require purely medical treatment, as catarrhal conjunctivitis, hence, in compiling statistics of the relative distribution of eye diseases here, I have decided to gather my material from one source—the dispensary. Furthermore, we have occasion to observe cases after operation, for due to lack of sufficient beds in the hospital, patients are discharged early and the medical treatment continued in the dispensary clinic. We have the good fortune to follow up cases. Very chronic and perplexing diseases which have baffled specialists come also to our attention and give us hard but interesting problems to solve.

In the "group practice" as followed in the hospital, we have seen interesting cases referred to us from other departments of the Free Dispensary, and we begin to learn to look at their complaints from a broad viewpoint. Cases of subconjunctival hemorrhage in children which frighten the parents prove to be secondary to pertussis. Run down children, mostly with tuberculosis or with exudative diathesis, or those greatly weakened by a protracted course of ileocolitis, are referred sometimes from pediatrics for the marked photophobia of the eyes. It is not uncommon to see in these children xerosis of the conjunctiva, severe phlyctenular conjunctivitis, or keratomalacia. Cases of eye inflammation of apparently unknown origin, rapidly improved after the carious teeth have been extracted by the dental surgeon of the dispensary. Some cases of moderate impairment of vision among parturient women which cannot be improved with glasses are found to be due to gravidic nephritis or to beriberi amblyopia. Scores of such interesting cases can be enumerated. Furthermore, we begin to find more truth in the prophecy of Batten that "further progress in ophthalmology as far as one can see will be mainly on medical lines."

The following table represents roughly the relative distribution of cases. These numbers do not indicate the totals.

TABLE OF DISEASES.

DISEASES OF THE EYES AND THEIR ADNEXA.

	1918	1919	1920	1921 (a)
Abscess, lids.....	25	25	23	24
Blepharitis.....	81	51	77	84
Cataract, senile.....	115	154	136	135
" traumatic.....	11	5	12	10
" juvenile.....	3	5	6	7
" glaucomatous.....	4	6	7	4
Chalazion.....	22	31	30	37
Conjunctivitis, catarrhal.....	720	575	609	649
" phlyctenular.....	285	274	226	271
" granular (trachoma).....	45	98	161	113
" follicular.....	110	77	103	61
Dacryocystitis.....	82	116	140	130
Episcleritis.....	26	20	18	36
Foreign body, cornea.....	48	51	40	55
" " conjunctiva.....	47	44	74	66
Glaucoma.....	19	38	36	25
Injuries:				
Conjunctivitis, traumatic.....	56	66	50	—
Corneal ulcer, traumatic.....	—	—	—	—
Contusion, eye.....	28	34	40	—
Subconjunctival hemorrhage, traumatic..	32	35	42	—
Iritis.....	6	17	29	22
Iridocyclitis.....	17	15	12	12
Keratitis (non-suppurative).....	98	58	50	52
" traumatic.....	16	14	13	—
" interstitial (mostly syphilitic)....	11	21	15	6
Leucoma.....	65	77	67	54
Macula.....	27	16	14	—
Nebula.....	16	10	20	12
Ophthalmia neonatorum.....	5	10	15	10
" gonorrheal.....	34	20	25	18
Optic neuritis.....	4	2	2	3
Optic atrophy.....	8	4	5	6
Panophthalmitis.....	31	29	20	11
Pertussis with subconjunctival hemorrhage.	10	15	18	—
Perforation cornea with prolapse iris.....	7	6	7	3
Pterygium.....	107	76	103	121
Phthisis bulbi.....	25	18	21	10
Retinal hemorrhage.....	—	—	2	1
Symphathetic ophthalmia.....	—	1	1	1
Tuberculosis, conjunctiva.....	—	—	1	1
Staphyloma, corneæ.....	31	22	16	8
" sclera.....	1	2	1	1

TABLE OF DISEASES—*Continued.*

DISEASES OF THE EYES AND THEIR ADNEXA.

	1918	1919	1920	1921 (a)
Stye.....	145	138	161	238
Scleritis.....	6	10	6	4
Tumors:				
Cysts, lid.....	3	4	3	9
Glioma, retina.....	—	1	—	—
Lipoma, subconjunctival.....	—	—	1	—
Epithelioma, orbit.....	—	—	1	—
Ulcer, cornea (non-traumatic).....	35	40	38	42
Xerosis, conjunctiva.....	10	12	14	11

BRIEF OBSERVATIONS ON SOME OF THESE DISEASES.

Conjunctivitis: This is the most common disease that we find in the dispensary. We have mostly the catarrhal, phlyctenular, follicular, trachomatous, and the gonorrheal conjunctivitis.

Catarrhal Conjunctivitis: The acute catarrhal predominates. Unfortunately extensive work for the determination of causative germs has not as yet been carried out due to lack of personnel. According to our statistics the disease shows no definite period of occurrence during the year as observed in other countries.

Phlyctenular Conjunctivitis: We find the great majority among children. Contrary to the general assumption that it has its origin mostly in children suffering from the so-called scrofulous diathesis, we find a large number of cases in apparently healthy children. Our statistics show that the disease has apparently no definite period of occurrence during the year.

Follicular Conjunctivitis: Usually found in young adults, majority among students and clerks.

Conjunctivitis Trachomatosa: The majority of cases have developed insidiously, and those whom the disease had attacked were not aware of it until their attention was called to it by certain physicians or nurses. The cases are usually discovered by health officers inspecting school children. Trachoma seems to be endemic in some of the towns of Cavite, as Imus, Naic, Kawit, and San Roque. Trachoma in

the cicatricial stage is quite infrequent. Eight cases only have been observed by me from Oct., 1919, until the present time.

Vernal Conjunctivitis: So far I have observed only one case of vernal conjunctivitis. The patient was a young man, complaining of photophobia and lacrymation on looking at bright light. The conjunctiva of the upper tarsus was covered with papillæ which were broad and flattened. The bulbar conjunctiva, however, appeared normal. The eyes presented a lesion very similar to a case diagnosed by a prominent ophthalmologist in San Francisco, California, as vernal conjunctivitis, and which we were fortunate enough to see.

Gonorrheal Ophthalmia: Most of the cases come from the city, especially from the district of Tondo. The disease is usually found in males. Out of 18 cases we had this year, 14 are males and the rest females; the males are usually infected by themselves from a urethritis from which they may be suffering at the time.

Ophthalmia Neonatorum: In the majority of our cases, infection has set in a week or so after birth. Subsequent infection by vaginal secretion of mother must have been the usual cause. Out of 10 cases observed this year, only one showed corneal opacities, and this happened because it did not receive any treatment for three months. Our table shows a gradual increase of the disease.

Pterygium: This is a common affection. Most of the patients are farmers and fishermen. The growth usually appears at the inner side of the conjunctiva of the eyeball. Two cases seen had marked impairment of vision as a result of extensive growth of the pterygium covering the pupillary area.

Cataract: Many of our patients are from the provinces, and the great majority come with cataract already matured or even hypermatured. Incipient cases come from the city and its suburbs. The age of the patient varies; the majority of those having senile cataract are between 50 and 60.

Besides the senile cataract we have observed the following types: (a) Soft or juvenile cataract, (b) traumatic cataract, (c) glaucomatous cataract, (d) congenital cataract. Two cases of congenital cataract have been observed; one in 1919 and another in 1920.

Dacryocystitis: My findings in regard to sex and types con-

firm my conclusion in the paper I read before this society last year about this disease, *i.e.*, it affects women more commonly, and that the chronic suppurative type predominates. Many seem not to give much attention to the disease, for not a few of our cases have come only when there is already marked inflammation of the lacrymal region with a history of old standing epiphora. Cases with septic corneal ulcerations and hypopyon are usually found in males.

Keratitis: Non-suppurative keratitis in the forms of superficial punctate keratitis, interstitial keratitis, and pannus is quite frequent: 98 cases in 1918. Majority of cases of interstitial keratitis give positive Wassermann test.

Glaucoma: The great bulk of our cases began with acute inflammation of the eye accompanied by violent pain in the eyeball radiating to one side of the head. It is these cases which have misled many general practitioners, thinking that the case was a general febrile disease with headache, and have treated the case as such when active ocular treatment of glaucoma is imperative. Unfortunately, many of our cases come to us with vision already gone or almost entirely lost, and what we can only do is to relieve the ocular pain and intense headache which rob the patients of their sleep. They are so advanced that usually no satisfactory fundus examination could be made. Glaucoma attacks women more frequently than men. Many of the patients attribute the cause of the disease to taking a bath after having stayed up late on the previous night, or sleeping with the hair wet. I think this belief is universal among our laity. In fact almost all cases of eye inflammation and blindness is thought to be due to either one of these.

Injuries and Foreign bodies: The common forms of injury observed are contusion of the eye and corneal ulcer caused by some small foreign bodies, as dust particles. In this connection I wish to call the attention of the audience to the harmful effect of *kahig* practised by our *herbolarios*. ("Kahig" is the process employed by our ignorant people to remove any foreign body in the cornea. This procedure consists in lightly scratching ("kahig" meaning scratch) the foreign body usually with the tender end of the stalk of certain kind of grass called "ulikbañgon." No anæsthetic of any kind is used and the procedure is done without the least attention to asepsis. If

the foreign body is well imbedded in the substance of the cornea, not only that the foreign body is not removed but a severe infection and extensive ulcerations invariably result.)

Errors of Refraction: Because of the rapidly increasing number of patients that have to be attended to in the dispensary, extensive work on refraction can not be performed. Most of our cases are of presbyopia and compound hyperopic astigmatism.

New growths: In 1919 we observed one case of glioma retinae, one of epithelioma of the orbit, and one of subconjunctival lipoma. Melanosarcoma was also seen in an old woman who later developed metastasis in the skin all over the body.

Conclusion: In conclusion we can say that conjunctivitis, hordeolum, cataract, and dacryocystitis seem to be the most common diseases of the eyes.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. H. DICKINSON, LONDON.

The meeting of the Section on November 10th took the form of a Clinical Evening. The Chair was occupied by the President, Mr. A. L. WHITEHEAD, of Leeds.

Cases and Specimens.

Mr. HUMPHRY NEAME exhibited and demonstrated two specimens of calcareous lenses which had become dislocated into the anterior chamber. Each of the patients gave a history of trauma, when probably the dislocation took place, and the calcareous deposits occurred later. The calcium content was demonstrated under the microscope.

Mr. Neame also showed, in a man aged 39, a case of retinitis circinata, which condition had been seen to gradually develop. First there was a hemorrhage, of about two discs diameter; three months later there was a swelling above this hemorrhage, and later still there was a gray-white coating on it. As it had remained constant three months, he did not regard it as a neoplasm. On the idea that it might be inflammatory, possibly tubercular, injections of Tuberculin were given, B. E., but no local exacerbation nor temperature reaction took place. Wassermann was negative, and there was neither sign nor history of syphilis. Other possibilities were a cyst of the retina, or exudative retinitis. His own feeling inclined to cyst of the retina, or exudative retinitis with a deposit, mainly fibrous, in the seat of a previous hemorrhage. He exhibited slides of a section from a case of the late Mr. Coats, in 1911,

who had the eye excised in 1921 by Mr. Greeves on account of a painful glaucomatous condition. The case seemed to show a connection between hemorrhagic retinitis circinata and exudative retinitis.

Mr. MALCOLM HEPBURN said many cases of **so-called retinitis circinata originated in the choroid**; the original inflammatory deposit occurred there, and the deposits were always more intense at the macula.

SIR WILLIAM LISTER referred to the case of a man who received a blow on the eye, and later developed a large sub-retinal hemorrhage in the region of the macula. It produced a plum-coloured spot. Gradually the hemorrhage absorbed, and disclosed a large choroidal rupture. There was seen a configuration of white areas, such as occurred in retinitis circinata, but as a mere temporary condition following the rupture. He believed that in retinitis circinata there was a low form of infection, which caused the change to become more permanent.

Mr. LESLIE PATON reminded members that the case of the condition shown recently by Mr. Williamson-Noble had a positive complement-fixation test to tubercle, and that Dr. Axenfeld strongly believed that many of the cases of vitreous hemorrhage in young people were tubercular in origin. The lesion in this present case might be tubercular, not a cyst. This view was supported by the PRESIDENT, who strongly suspected the tuberculous origin of spontaneous hemorrhages.

Mr. NEAME, in reply, said he thought there might be a number of causes of retinitis circinata, which he regarded as a physical sign.

Mr. MONTAGUE HINE showed a boy aged 6 with **congenital dislocation of lenses**, and asked advice as to what was best to be done. Some had advocated leaving such a case alone until later in life, meantime watching it and noting alterations in vision; others suggested operation, either iridotomy, iridectomy, or discission of the lens. He also asked what was the ultimate end of these cases. Did the patients survive until adult age, or did a complication supervene?

The PRESIDENT said he had operated upon two or three such cases, fixing the lens with one needle, and breaking it up with another. The cases did well in respect of the lens

operation, but the vision was always sub-normal, probably because there was some congenital amblyopia, which caused the lens to be out of place.

Mr. HARRISON BUTLER spoke of having operated on some cases of the kind by a method advocated in America, following a preliminary iridectomy. This he described. In a case he did five years ago there was now some shrivelling of the iris, but vision was now $\frac{6}{18}$. If these cases were left, in some there was dislocation into the anterior chamber, and glaucoma; in others the lens dropped into the vitreous and caused cyclitis.

Mr. GREEVES spoke of having operated upon cases with a Ziegler knife, and vision improved from below $\frac{6}{60}$ to $\frac{6}{18}$ or $\frac{6}{12}$.

Mr. LEIGHTON DAVIES said the decision whether to operate or not should largely depend on whether the edge of the dislocated lens lay outside the pupillary area when the pupil was contracted. If it came just to the pupil, the case was better left alone. In a young child it was better to do needling than a large operation like extraction.

Mr. LESLIE PATON showed a case of cavernous angioma of the orbit, with microscopic sides. The patient was aged 76; and there was no trace of anything wrong until she was over 70. He found a growth the size of a walnut, but it was encapsuled, and came away very nicely, without subsequent bleeding. At some stage in her life there had been a fracture of the upper margin of the orbit, and he wondered whether there was a connection between that and the much later development of angioma.

Mr. PATON also showed a case of recurrent detachment of retina after 17 years of reposition. Since 1904 the man had had quite a number of operations. The eye in which the detachment occurred was of normal refraction.

SIR RICHARD CRUISE related a case in his experience which had re-attachment of retina after ten to twelve years of complete detachment. There had been no shrinking, and therefore there was a readjustment of the retina to the concavity of the sclera. This also was in an eye of normal refraction.

Mr. R. A. GREEVES exhibited a man, 37 years of age, who had bilateral proptosis, dating from a year ago in one eye, and five months ago in the other. His trouble was double vision, especially on looking upwards. The question was

whether it was a case of Graves' disease; he did not think that was probable. There was a tremor of the hands, but no tachycardia nor thyroid enlargement.

The PRESIDENT and Mr. REA favoured the idea of exophthalmic goitre.

Mr. OLIVER showed a patient on whom he had done a very successful plastic operation for contracted socket. In order to obviate the continued discharge and subsequent contraction often seen in these cases, he removed the whole of the conjunctiva, including that of the lids themselves; in this case he took away everything down to the periosteum. The man could now wear an artificial eye. The method was applicable to cases of exenteration of the orbit, in which there was no need to remove the lids. If skin-grafting were resorted to, it was important to skin-graft the under surface of the lids.

The PRESIDENT congratulated Mr. Oliver on his result.

Mr. FRANK JULER showed a girl aged 15, the subject of macular degeneration associated with mental deficiency. The disease seemed to start at the macular region in both eyes. The vision had been very defective three years. Earlier the optic discs were pale, of the waxy type of atrophy. The pigmentary changes in the periphery were now more marked than formerly. There was no history nor sign of syphilis in the child, but the mother gave birth to a premature child, then to one which died in 14 days. Before her sight became bad, this girl was in the lowest standard at school, and now that she was attending a school for the blind she was unable to learn like the other children did. He asked for views as to whether this was a typical retinitis pigmentosa, or a very chronic syphilitic retinitis, with secondary atrophy of the nerve, or a case of Batten's cerebro-macular degeneration. There was no paternal consanguinity.

Mr. RAE showed cases of ruptured ligamentum pectinatum, and of gummatous exudation at the base of the brain, optic neuritis, and diplopia. In regard to the second case, he spoke of a case in which Sir Charles Ballance did a decompression operation. The Wassermann reaction was positive. Within a fortnight of the operation the papilloedema had almost disappeared, the paralysis had gone, and the woman was now at work. Following the operation the patient was thoroughly

treated with anti-syphilitic remedies, the novarsenobillon being followed by mercury and iodide.

Discussion on the Differentiation and Prognosis of Arterio-Sclerotic and Renal Retinitis.

A combined meeting of the Sections of Medicine and Ophthalmology was held on Tuesday, 28th of November, under the chairmanship of the President of the Section of Medicine, Dr. G. NEWTON PITT.

Dr. H. BATTY SHAW, speaking from the medical side, said he had had the opportunity of studying the clinical aspects and the post-mortem findings in a number of cases in whom the heart was found, at the necropsy, to be hypertrophied, and the only way he could explain the facts the cases revealed was to jettison former explanations and seek others. Some of the observed cases died of uræmic symptoms, yet the kidneys did not show the changes usually described as occurring in them. Albuminuria was present in varying intensity, or it was absent, yet the kidneys presented no uniform appearances leading to the view that they were responsible for the former, or of the latter, condition of the urine. Nor did the changes in the retinae reveal what form of kidney was present in the cases. Some of the cases which had shown signs of grave disorganization of the brain disclosed a brain which, to the naked eye, was normal, and its vessels presented no change in either middle coat or intima. The phenomenon known as hyperpiesis seemed to be directly associated with the cardiac hypertrophy they all presented, and it was very variable, and nothing had yet revealed why these fluctuations occurred. He had been taught to believe that this phenomenon was caused by arteriosclerosis, which, for the present discussion, he would limit to the change met with in the middle coat of the arteries. The question which arose was, How could the variable hypiesis be due to the stable arteriosclerosis? He believed there could be no such dependence, and he had to invoke the presence of a variable amount of poison in the blood to explain the variable hypiesis, as also the arteriosclerosis. This likewise got over the difficulty of explaining the correlation of many of the accepted signs of "renal" disease

when little or no actual renal disease was present. A break-away had occurred in regard to the nomenclature of kidney disease, and the kidney changes were now held more to be due to toxæmia resulting from bacterial action at a site remote from these organs. Changes in the intima of the arteries could be produced experimentally by the injection of bacterial toxins, and now it was claimed that the changes in the middle coat were of the nature of a chronic inflammation. His strong inclination was towards the toxic view.

Ophthalmic surgeons admitted that they met with difficulties in differentiating arteriosclerotic retinitis from albuminuric retinitis; they had also admitted that an arteriosclerotic retinitis might be succeeded or accompanied by the signs of renal retinitis. Some ophthalmological experts were now prepared to concede that the changes in the retina in renal retinitis were toxic, and that the seat of origin of the toxic agents was pre-renal. So that, for them, even renal retinitis was a misnomer. Why did changes occur in the retina in arteriosclerotic retinitis? When the hemorrhage had passed off, no sign of ruptured retinal artery or vein had yet been demonstrated. He believed the hemorrhages were likely to be capillary in origin. Where did the white patches seen in arteriosclerotic retinitis come from? If they were formed from local elements, what provoked their formation? Surely the cause was not arteriosclerotic changes. Was not a blood-borne noxious agent more likely? A general infective agent seemed to be behind all the changes, even those in the middle coat of the arteries. It was said that renal retinitis was always bilateral, yet works by ophthalmic surgeons revealed that "renal" changes might be shown in one retina by unilateral papilloedema, conforming with the observation that blood poisons need not necessarily produce symmetrical changes. The question might well be asked, What was the source in secondary anæmias of the development of soft-edged white patches in the retina indistinguishable from the "cotton-wool" patches of renal retinitis? He thought it likely that the changes met with in arteriosclerotic retinitis were not due to the vascular change, but that the hemorrhages and white patches and the slight change in the disk differed only from those in renal retinitis in being called into operation

by a slower influence of blood poisons. It was more reasonable to look upon arteriosclerosis as a first effect, and arteriosclerotic retinitis as a later one, effects of a toxæmia which acted slowly and in minimal quantity, and when it acted in large bulk, the other type of retinitis resulted. But this latter needed a name other than renal, for the changes in the kidney might be minimal. For the terms now current he suggested "chronic," "acute," "late," "early," leaving for the future the investigation of the nature of the toxin concerned.

The Retinitis of Arteriosclerosis.

The debate from the ophthalmological side was opened by Mr. R. FOSTER MOORE. He said his object was to bring forward evidence supporting the view that in some cases of arteriosclerosis a distinctive form of retinitis was developed, due, in his belief, to a local vascular disease in the retina. These cases had usually been confused with those of renal retinitis, and it had been said that renal retinitis in the old was less serious prognostically than in the young. He set out to establish the following three propositions:

1. That the ophthalmoscopic appearances of the condition were, in large measure, distinctive as compared with renal retinitis.

2. That the retinal exudates were developed as a result of the local vascular disease in the retina.

3. That as to length of life and manner of death, this ophthalmoscopic condition implied a prospect in sharp contrast with that conveyed by renal retinitis.

He submitted a table of 47 cases of retinitis, most of which he had observed for a number of years, and giving many important features.

In regard to the first of his propositions, he said that in most cases of general arteriosclerosis the retinal arteries shared to such a degree that their condition was recognizable by the ophthalmoscope; certainly this was so in 70% of 44 consecutive cases seen at St. Bartholomew's Hospital. He believed exudates were due to a thickening of the coats of the arteries and a reduction of their lumen. In these cases he thought the local pressure in the retinal arteries was less than normal,

although the pressure in large arteries was raised. The areas of exudate, though not pathognomonic, had features which rendered them in large measure distinctive. This form of retinitis was frequently unilateral; it was so in 28 instances out of 45. Still, evidence of disease of vessels was always present in the other eye. The unilaterality did not persist for very long. Individual spots of exudate could be proved to disappear and leave no trace; but usually fresh ones were simultaneously appearing. In two of the cases, disappearance of the exudate followed thrombosis of the retinal artery. The chief points in which the ophthalmoscopic appearances differed from those of renal retinitis were: the character and distribution of the exudate and the changes seen in it, the frequency with which it was unilateral, its association with severe retinal vascular disease, and the absence of œdema and of "cotton-wool" patches.

In support of his second proposition, he quoted the history and course of a number of cases. One, under the care of the late Mr. Marcus Gunn in 1908, had, at that time, extensive arteriosclerosis but no retinitis. Her urine was free of albumin and sugar. This was the condition until 1910. In 1911, she came under the late Mr. Coats, who found white glistening spots disposed radially round the macula, and albumin in the urine. When, in 1913, Mr. Foster Moore saw her, she had a blood pressure of 250mm, a cloud of albumin in the urine, and retinitis in each eye. In 1918 she had a stroke, and her blood pressure was 260mm.

With regard to his third proposition, it was true that few patients lived so long as two years after renal retinitis was discovered. Of Belt's 419 patients, 94% died within 2 years. But the prognosis was less grave and more uncertain than in renal cases. Cerebral apoplexy might, in such patients, occur at any time; on the other hand life might be prolonged for several years. As to the manner of death, in a considerable proportion it was from uræmia in renal retinitis. Exactly 50% of his own cases died of a gross vascular cerebral lesion.

In conclusion, he said the condition called for separate recognition, and he considered that the term "arteriosclerotic retinitis" seemed appropriate.

Mr. P. BARDSLEY said he had long held the views of Dr.

Batty Shaw on the toxæmic origin of retinitis and sclerosis, views which he had himself brought forward more than once. He admitted that the picture of arteriosclerotic retinitis drawn by Mr. Foster Moore was correct, but thought the description applied only to very chronic cases; stated otherwise the retinitis depended on the acuteness of the disease producing the sclerosis. But if the toxin was more drastic, or an exacerbation occurred, the resultant picture resembled closely that of the so-called renal retinitis. He quoted a case in support of this. There were four classical changes in renal retinitis:

1. Retinal œdema, resulting in radiating lines or a macular star.
2. The fatty spots.
3. The hemorrhages.
4. The high pressure signs in the vessels.

All these signs might be present in three groups of cases without albuminuria, viz., in intracranial pressures, in advanced arterial sclerosis, and in many toxæmias. As, therefore, these retinal signs occurred frequently without albuminuria, and the latter could only be diagnosed by urine analysis, the term "renal retinitis" ought to be abolished, as it was misleading. The ophthalmoscope showed there was a toxæmia causing high blood pressure and vascular inflammation, also whether there were sclerotic changes in the vessel walls. On this latter, prognosis largely depended. If such sclerosis was present he believed death was a matter of only months, possibly weeks. If there were but little sclerosis with the raised blood pressure, there was a prospect of fair length of life. The sclerosis was the index of the chronicity of the poison, not of its acuteness. He contended it was possible to detect sclerosis in the vessels when high blood pressure was not present, and physician and patient could be forewarned. He gave a striking illustration of this.

Mr. P. H. ADAMS (Oxford) described the case of a man with a wound in the hip-joint, who complained of blurred vision. He had typical renal retinitis, slight papilloœdema, soft "cotton-wool" patches, and hemorrhages, with a stellate figure at each macula. Yet practically nothing abnormal was found in his urine. His wound was very septic, and he was extremely ill, but after amputation and free drainage he quickly recovered

both health and sight, and was still well. This showed that toxæmia could itself cause the condition known as renal retinitis, without the kidney being involved. He believed that Dr. Batty Shaw's explanation would prove to be the correct one. His experience as to the length of life of these patients agreed with that of Mr. Foster Moore. He was more convinced than ever that a prognosis could not be made on the eye condition alone. Further research on the matter should be carried out jointly by physicians and ophthalmologists.

Dr. ARTHUR ELLIS spoke of a preliminary investigation he had been conducting with two colleagues on this subject when he received the invitation to take part in this debate. It was concerning 19 cases showing retinitis in which an estimation of renal function had been made. All the patients, with one exception, had a high blood pressure; in only 3 was it less than 200mm, *i.e.*, in one it was 180, in one 160, in another 148. In this last case Mr. Goulden reported one hemorrhage and that both fundi showed central degeneration and thickening of vessels in both retinae. In 8 of the 19 cases there was evidence of gross renal damage and loss of function, with marked retention of urea in the blood. In 6 of the 8 there was a fixation of specific gravity. Of those 8, 4 were now dead of uræmia, one of broncho-pneumonia, and one was now dying of obvious renal inefficiency.

In the remaining 11 cases there was very little evidence of gross disturbance of renal function; in only 2 was there retention of urea in the blood, and in none of these was there fixation of specific gravity. Only 2 of these 11 patients were known to be dead, one of cerebral hemorrhage, the other of myocardial failure. The important question was, Was one of these groups a further stage of the earlier group? Before this could be settled, there would have to be a large series of post-mortem examinations in cases which had been carefully observed and followed throughout their diseased life.

Dr. C. O. HAWTHORNE, in a careful speech, protested against applying to the conditions under discussion terms which assumed definite knowledge when such was, so far, lacking.

Dr. J. F. GASKELL expressed his agreement with Mr. Foster Moore's views on renal and vascular disease. Two conditions, of entirely different pathology, were concerned: one primarily

a disease of the kidneys, the other of the vascular system as a whole. With regard to the first of these, there were various stages of diffuse nephritis with which were associated the forms of retinitis called albuminuric. The second condition was a cardiovascular one, in which three factors always played a part: raised blood pressure, cardiac hypertrophy, and disease of small arterioles of certain organs. In the purest examples of this condition the vascular changes of a degenerative nature were confined to the small peripheral arterioles, the largest arteries being free from the change. The kidney involvement was never sufficient to make primary failure of this organ the cause of death; the latter was almost always due to the changes in the brain, cerebral hemorrhage being by far the commonest occurrence. It was difficult to know whether the arteriosclerotic changes in the arterioles were secondary to the high blood pressure, or whether the latter was a response to obstruction to the peripheral circulation through essential organs. He agreed, however, that the changes were due to a cause which acted on the circulation as a whole. He favoured the term suggested by Sir Clifford Allbutt, namely, hyperpiesis.

Resumed Debate on Arteriosclerotic and Renal Retinitis.

This debate was resumed at a joint meeting of the Sections of Ophthalmology and Medicine on Friday, December 8th, the President of the former Section, Mr. A. L. WHITEHEAD, occupying the chair.

Mr. ERNEST CLARKE re-opened the discussion. He said he thought the papers on this subject by Dr. Batty Shaw and Mr Foster Moore would prove to be epoch-making. The teaching many years ago, and until quite recently, was that high blood pressure was the cause, or one of the causes of "hemorrhagic retinitis," and patients were sent to a physician to have that pressure reduced. It was now seen that high blood pressure was but one of the symptoms; it might even be a protective measure. The best term for the condition was, probably, "hemorrhagic retinitis." With regard to the exudates which occurred, he asked where they came from, and what caused them. If they were due to toxins, why should they not occur in both eyes? If they were associated with a hemorrhage, the

last question was answered. It would be useful, in future, where hemorrhage was seen in one eye, to take the tension of both the patient's eyes with a tonometer. He asked whether Dr. Batty Shaw suggested that the thickening of the middle coat and the intima were followed later by degeneration of these coats. Even the oozing hemorrhages presumably must be regarded as danger signals, a first stage which, if allowed to continue, might develop into so-called arteriosclerotic retinitis, and later into renal disease.

Dr. W. N. GOLDSCHMIDT related a fatal case of pre-renal toxæmia showing the clinical symptoms or signs of chronic parenchymatous nephritis. He said the success of an attempt to distinguish between "renal" and other forms of retinitis turned partly on what symptoms and signs other than retinitis justified the labeling of a case "renal," and the case he quoted illustrated the difficulty of the problem. He also entered into the question of the effect of decapsulation of the kidney and other remedies.

The patient was a man aged 42, and he came complaining of swelling of legs and abdomen for six weeks; he also had shortness of breath on exertion and occasional headaches. His only serious illness had been an influenzal febrile attack in Egypt in 1918. There was no venereal history. He had marked oedema of abdomen, legs, and back, with ascites; blood pressure 132mm. There was some pleural effusion at both bases. He had pyorrhœa and abdominal meteorism, and there was great flatulence after meals. About 200cc of urine (sp. gr. 1030) was passed in 24 hours, and it contained 2% of albumen. There were in it red cells and numerous casts, but the urea concentration was about normal. Wassermann reaction negative, fundi normal. No progress was made under medicinal and dietetic measures, therefore decapsulation of a kidney was tried, Mr. Gwynne Williams carrying out the operation. The kidney was found to be of normal size & color. The intestines were pale, but there was no peritonitis visible. Four days later he passed 900ccm in 24 hours, and the oedema was somewhat less; 10 days after the operation it rose to 1,200ccm, the albumen being .36%. Within four days, however, it dropped quickly to 600ccm. As it was possible the increased output of urine might have been due to the

operation, it was decided to repeat it on the other kidney, and this was done seven weeks after the first; the capsule, which was not tense, was slit and retracted. Several pints of milky fluid—as in the first operation—were removed from the abdomen. The speaker related the clinical course in great detail; the end was death. The post-mortem changes were also detailed. The sections of the piece of kidney removed during life showed definite slight changes such as could be produced by a toxic agent arriving in the blood stream. The sections removed after death showed only slight changes in comparison with a normal kidney. Therefore the illness did not seem to be accounted for by the state of the kidneys. It was probably due to a pre-renal poison which caused exudation into the tissues.

Mr. LEIGHTON DAVIES (Cardiff) said ophthalmic surgeons agreed there was a distinct difference between hemorrhagic retinitis with sclerosis on the one hand, and retinitis associated with albuminuria on the other, and these were largely recognisable by the retinal picture. But it had to be remembered that all people were not cast in the same mold, and there would be different reactions to the same morbid process. Hence no clinical group could have hard and assigned lines given to it; there would always be borderland cases, consisting of abnormal types. The two groups of conditions differed also in the matter of prognosis as regards life, the expectation of life being definitely greater in the arteriosclerotic than in the renal cases. That a like toxin should produce different reactions in different persons had an analogy in the case of the pneumonia bacillus: in one there would be croupous pneumonia, in another meningitis, in a third synovitis. A kidney of disordered function might lead to retention of material which acted as a poison, yet it did not follow that what caused the nephritis produced also the retinitis. Of 15 cases of the arteriosclerotic type, only one showed hemorrhagic retinitis. The importance of blood pressure in the conditions under discussion had been made clear. He did not think knowledge was sufficiently wide and certain to embark upon a new nomenclature.

Mr. M. S. MAYOU showed, by the epidiascope, sections of arterial degeneration in the retina, of thrombosed central

artery following vascular sclerosis, of thrombosis of central vein, a vein blocked by a fibrous clot, and an inter-retinal hemorrhage which had destroyed the retina right through. He also depicted exudations into various layers.

Dr. G. NEWTON PITT, O.B.E., reminded the meeting that the changes which took place in the large vessels, the medium vessels, and the arterioles were independent one of the others. It was often assumed that in cerebral hemorrhage arteriosclerosis was present, but there were autopsies on many cases of the kind in which the arteries, including the middle cerebral, were not extensively diseased. And the number of cases of cerebral hemorrhage with marked interstitial nephritis was quite moderate. What he had said, applied equally to the case of the retina, whose vessels closely approximated in size to those usually giving way in the brain. It was desirable to ascertain the relation between the cases which died of cerebral hemorrhage on one hand, and those who died of a condition in which there were retinal changes. The occurrence of cerebral softening and cerebral hemorrhage in the retinal cases raised the question whether the lesions were due to the rupture of a minute vessel, or to a thrombosis. In many cases, he thought, the latter was indicated. He agreed that the prognosis in the two classes of cases was quite distinct. In some cases having arteriosclerotic vessels he thought some of the tissues were suffering from too low, rather than too high, a blood pressure.

Dr. FEILING spoke of a study he had made of 30 cases from the standpoint of the physician, all the cases having been referred to him by his ophthalmic colleague. Only 5 of these were renal, their average age was 43.8 years, and all had well-marked bilateral retinitis. The average systolic blood pressure was 235 mm , the diastolic 135. In the 25 in the arteriosclerotic group the average age was 63.3 years, and 15 of them were females. Sixty per cent. of these had unilateral retinitis. The average pressure of the blood in these 25 was 214 systolic, 118 diastolic. He discussed the various theories of causation, and asked attention to the mechanical form of causation, such as in a case in which marked visual defect occurred in as short a time as 12 hours.

Mr. J. HERBERT FISHER reminded the meeting that in 1915

he read a paper before the Ophthalmic Section on the retinitis of pregnancy, in which he advocated the use of the term "Toxæmic retinitis of pregnancy" instead of albuminuric retinitis of pregnancy. Obstetricians believed that pathological vomiting of pregnancy, eclampsia, acute yellow atrophy of liver, and the necrotic changes of the kidney cortex which accompanied the albuminuria of pregnancy were due to a toxin, and that this might be produced by perverted katabolic processes in the syncytium cells shed from the chorionic villi and put into the maternal circulation. In the organs liable to attack the stress was on the blood vessels, hence hemorrhages were a conspicuous feature. It was reasonable to infer that the fulminating lesions in the retina in these cases, with the exudates, hemorrhages and œdema, were due to the same cause. Mr. Fisher also referred to that disease of later life, retinitis circinata. This was so chronic that its explanation on the basis of an alteration in the arterial tunics fulfilled every requirement without invoking an absorption toxæmia.

If the toxic explanation of both varieties were accepted, it was reasonable to expect that in the arteriosclerotic cases with efficient kidneys the toxin should be found abundantly in the urine but in low concentration in the blood; while in the albuminuric cases the toxin should be found in concentration in the blood but only sparsely in the urine. Perhaps pathologists could determine what the toxin was.

Dr. HARFORD said it appeared from Dr. Batty Shaw's introductory paper and from the remarks of subsequent speakers that there was no such close relationship between changes in the retina and disease in the kidneys as had been commonly held. This required a review of the situation, meantime refraining from giving the grave prognosis which previously held views suggested, for such a forecast might hasten the fatal issue. Probably the appearances in question were common to many forms of disease which caused changes in the periphery of the vascular system. He quoted the following from a paper read by Professor Hugh Maclean at a meeting of the British Medical Association:

"There are many subjects who show but little evidence of marked cardiovascular changes, but in whom the renal system is hopelessly inefficient. Conversely, it is not uncommon to

find patients with very marked cardiovascular changes in whom but little evidence of renal disease can be ascertained. These points must always be taken into consideration in estimating prognosis, for, in a general way, apart from such accidents as cerebral hemorrhage, the outlook in a patient with high blood pressure is not so bad if the kidneys are efficient. Indeed, such patients may enjoy comparatively good health for many years, even with a blood pressure as high as 200mm of mercury or even more. This observation explains the curious cases one occasionally finds quoted in the literature in which a history of high blood pressure of 250 or over, frequently associated with retinitis and other eye changes was not incompatible with the enjoyment of fairly good health for several years." He deprecated the continuance of prophecy as to the date of a sufferer's death when he had this disease, because of the "emotional trauma" set up. In a case of panic there might be a state akin to temporary paralysis, or, in passion, violent muscular tremors.

With regard to the changes in the peripheral circulation, assuming that, as Dr. Batty Shaw said, there was a toxic process affecting both kidneys and retina, the problem was that of the selective action of the various toxins causing changes in the various vital organs. There was much evidence to prove the profound influence of suggestion upon local inflammations and vascular disturbances, and he hoped the teaching of modern psychology would be considered in its relation to obscure problems of pathology.

Dr. BATTY SHAW, dealing in his reply with some of the speeches at the first meeting, said the discussion had at least given an opportunity for a statement of claim to those who believed there was something behind arteriosclerosis which was also responsible for other changes, such as those met with in the retina when the blood vessels of that tissue were altered, and for similar changes in the retina when such vascular change was slight or absent. It encouraged those who looked for some agent responsible for both, in the blood circulating in the vessels. All that had been said against the view that arterial disease was responsible for so-called arteriosclerotic retinitis could be equally urged against the view that the contracted kidney was responsible for uræmia.

He thought a large proportion of Mr. Foster Moore's cases showed hyperpiesis because there was some pressor body circulating in the blood stream.

Mr. FOSTER MOORE also replied. He said it was clear to him that there was such a thing as a retinitis due to toxæmia, and retinitis might occur from local causes in the retina. In renal retinitis there were two factors at work: the toxic one, which showed itself by the "cotton-wool" patches and the fibrinous exudate in the retina; and the vascular factor, which was seen by the sharp dots mentioned, and by the hyaline degenerate in the external molecular layer of the retina. And both factors might be concerned in a case. He did not suppose the hemorrhages in the retina were due to rupture of large vessels; they were probably due to diapedesis from the capillaries, owing to the altered condition of the blood. And in these cases he thought the blood pressure in the small vessels was lower than in health, even though the blood pressure in the brachial artery might be 250mm. And in anæmia the hemorrhages came about in the same way, through impaired nutrition in the capillary walls due to the poor blood. Mr. Bardsley said "copper wire" arteries might disappear, but such an occurrence was outside the speaker's experience. In answer to Mr. Ernest Clarke, he thought the exudates were due to degenerative changes in the external molecular layer of the retina, owing to the impaired circulation in the retina.

He did not pretend it was possible to draw a hard-and-fast line between arteriosclerotic and renal retinitis. He did not think the hemorrhages were due to emboli in the retinal vessels; they were different from the hemorrhages associated with infective endocarditis. It would be found, on following cases up, that a considerable proportion of cases of severe retinitis developed detachment of the retina.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By DR. BEN WITT KEY, SECRETARY.

MEETING OF OCTOBER 16, 1922.

DR. J. M. WHEELER, CHAIRMAN.

DR. ISAAC HARTSHORNE and DR. RAYMOND HAWKINS reported a case of **orbital cellulitis**. W. L., boy, aged 14 years, complained of pain and swelling of the right eye, of three days' duration. No history of injury or sinus disease.

The lids of the right eye were tightly closed and swollen. Erythema, tenderness on palpation. No motion of the globe in any direction. No deep circumcorneal injection. Pupil reacted, vision nil. Left eye normal throughout. Rectal temperature 103° . General examination, including X-ray of nasal sinuses and teeth, and lumbar puncture, negative.

On April 22d, two days after admission, an incision one inch long was made through the eyelid, just below the supra-orbital margin at the nasal side. The roof of the orbit was normal and no free pus encountered. On April 26th, a similar incision was made just below the supraorbital margin at the temporal side, but no free pus found even on extensive probing into the orbital contents. Temperature for the first week ranged between 102° and 105° rectal. On the eighth day it began to fall rapidly, and by the 9th was 100° .

At the suggestion of Doctor Alfred Wiener, intramuscular injections of 10cc of whole milk, boiled three minutes, were begun on fourth day. Leucocyte count rose from 17,000 to 17,700. The chemosis became less marked, patient was brighter, and general condition improved. Three days later another injection of 10cc of milk was given, and these were continued every second day until the temperature was normal.

The leucocyte count increased immediately following each of the earlier injections. No chills or sharp temperature reactions experienced.

On the fourth day after admission, vision improved to counting fingers at three feet, ocular movements increased, and the mental condition became clearer. Two days later (after the second incision) there was temporary increase of limitation of motion upward. At the same time, the mental condition again became cloudy and there were distinct signs of meningeal irritation, shown by a slightly positive Kernig, a positive Oppenheimer, and increased knee jerk on the left side. These signs disappeared in two days.

The eye gradually improved until on discharge, September 15, 1922, these findings were present: Corrected vision, right eye $\frac{7}{8}$; left eye $\frac{3}{8}$. Rotation practically normal.

This case was severe enough to classify as a thrombophlebitis, which is usually fatal. In consultation with Doctor Cutler and Doctor Wiener, the question of exenterating the ethmoids and the orbit was considered. Before leaving the hospital the tonsils were removed. They believe that the use of a foreign protein in the form of boiled milk saved his life. During the first ten days they fully expected that he would succumb. After each of the earlier injections the patient seemed less toxic and brighter, and there was a slight rise in the white count.

DISCUSSION: DR. ALFRED WIENER congratulated Dr. Hartshorne on his persistent and successful treatment of this case by means of non-specific protein therapy. He wished to appeal for more general use of milk injections in combating ocular infection.

DR. CLYDE E. MCDANNALD in discussion reported a case of orbital cellulitis followed by meningitis and death. The patient, a child, aged 5, was seen first September 30, 1922. History of boils and styes for the past six months. Marked swelling of the left upper lid with redness near the outer angle and considerable oedema of the surrounding tissues. Temperature 103° . Removal to a hospital was advised and there an incision was made into the upper lid which failed to release any pus. Under hot applications the swelling and oedema increased rapidly extending to the side of the head and

occiput. Thirty-eight hours later the X-ray indicated an involvement of the left ethmoid and on advice in consultation an external ethmoidal operation was made but again no pus was found. Temperature continued high and next day rigidity of the neck and limbs, followed that night by death. Cultures from the pus, blood and spinal fluid revealed staphylococcus aureus infection.

DR. C. BARNERT said it was his painful duty to put on record a case of general septicæmia with fatal termination, following an injection of the milk preparation, Aolan, but he added that the fault was not in the use of the preparation per se but in the inexcusable carelessness of the physician who persisted in employing a broken ampule in which the milk was curdled and undoubtedly septic after exposure to the air for an indefinite period. The victim, a young college man, had received eight injections of 10cc each with marked benefit, for a long-standing folliculitis of the lid margins and a general furunculosis, and desiring to continue the treatment without interruption of his college work, continued the injections under the auspices of his college infirmary doctors, where after three harmless injections, the deliberate injection of an open, infected ampule caused his death.

A case of **accessory lacrymal gland with cystic duct** was reported by DR. ISAAC HARTSHORNE and DR. RAYMOND HAWKINS.

M. I., girl, aged 15 years, complained of internal strabismus of the left eye. The mother had noticed, when the child cried, a swelling at the external canthus of the left eye. The swelling was never painful, gradually increased in size, never became red or gave any trouble. After crying the swelling disappeared in from one to two hours.

After careful refraction, she was admitted to the hospital, and on July 25, 1922, tenotomy of left inferior oblique was performed, to correct the upward and inward deviation. At the same time, under anæsthetic, the tumor at the external canthus became as large as the end of the little finger. It was excised en masse, and one suture taken in the conjunctiva. August 1, 1922, partial tenotomy of left internal rectus was performed. Eyes now perfectly straight with correcting glasses.

Microscopic examination of section by Dr. L. C. Knox as follows: "Section shows that about half the specimen consists of a solid mass of glandular tissue resembling normal lacrimal gland. There is slight focal infiltration with round cells, especially along the course of the smaller ducts. Very thin capsule. The remainder comprises a collapsed cystic duct lined with slightly flattened cuboidal epithelium and supported by hyaline fibrous membrane. A few striated muscle fibers and nerve filaments are included in the outer portions of this stroma. The wall of the duct shows a moderate degree of chronic inflammation, being much congested and infiltrated with round cells and eosinophiles."

DISCUSSION: DR. ISADORE GOLDSTEIN stated that study of the macroscopic and microscopic examination of the gland and its covering leads him to prefer the term "sheath" to that of capsule of the gland.

DR. S. A. AGATSTON had seen a case of double cyst of the lacrymal gland.

A case of **tuberculoma of the choroid** was reported by DR. CYRIL BARNERT. E. K., aged 35 years, one week prior to first examination (Jan. 3, 1921) complained of intermittent diplopia and distortion of objects. No pain, inflammatory signs or headache. Previous history negative.

Examination—Both eyes appeared normal in every respect except definite pallor of both disks, and in the macular region of the right eye a circular, sharply-outlined area, about 2mm in diameter, dark green in color, adjacent to which were tiny extravasations of blood below and on either side. The vision was $\frac{2}{200}$, unimproved. Perimetry disclosed a small central absolute scotoma, with normal fields otherwise for form and colors. The left eye was normal; vision = $\frac{3}{8}$.

General physical examination by an internist showed no other abnormality. The Wassermann reaction was negative, as were the examinations of the urine, teeth, blood and accessory sinuses. A cuticular injection of old tuberculin $\frac{1}{2}$ mg produced no reaction, but a second dose, three days later, of one and one half mg produced a wheal at the site of injection, a temperature varying between 101 and 102 degrees for 24 hours and slight ciliary injection in the right eye. Systemic treatment with tuberculin residue was thereupon instituted,

beginning with 10000mg , increasing the dose every third day one quarter until $\frac{1}{2}\text{mg}$ had been given. Local treatment was limited to subconjunctival injections of normal saline solution, and instillations of dionin. Meanwhile the local lesion persisted, growing slowly in size, with persistent sanguineous oozing about it. Removal of the tonsils was recommended and performed without benefiting the eye. The course of tuberculin injections was repeated a second and a third time without arresting the process, in fact, during the third series, which is not yet quite completed, a fresh exudate from the choroid was observed on October 1st, increasing gradually until it completely overshadowed the older lesions, and presenting the striking picture of a dirty white fluffy mass in the macular region measuring one and one half disc diameters. The vision is now reduced to $\frac{1}{200}$.

The case is presented as a striking clinical picture, but more particularly as an unusual instance of the failure, so far, to control a tuberculous process in the choroid.

DISCUSSION: DR. A. E. DAVIS stated that the diagnostic dose given the patient was too large. In such cases where hemorrhages are already present in the choroid or retina, we should be extremely careful both in the diagnostic and therapeutic doses, that they be not too large—else increased hemorrhage may be brought about and permanent damage follows. Tuberculin given in small but gradually increasing doses should be carried out over a long period of time.

DR. BARNERT in reply stated that he gives $\frac{1}{2}$, $1\frac{1}{2}$, and 3mg and without any apparent harmful effects. Three full days intervenes between injections.

DR. GEORGE H. BELL presented the paper of the evening, "**Reform Diet as a Therapeutic Measure in Ophthalmic Practice.**"

Dr. Bell emphasized that the "Reform Diet" is part and parcel of his remedy for the "Three T's." All patients must be given the "acid test" for the "Three T's" (teeth, tonsils and toxæmias of the intestinal tract).

He claims that gastro-intestinal disturbances and severe septic intoxication are, at times, brought on or aggravated by oral sepsis, diseased tonsils or wrong food combinations and not infrequently by all three. Before putting patients on

"Reform Diet," hygiene of the mouth and throat is insisted upon. He urges the eating of raw milk, raw fruits, green vegetables and salads.

The principle of the "Reform Diet," he explained, is dependent upon avoiding the mixture of heavy starches and proteins at the same meal as well as the reduction in the intake of sugars and sweets.

He refers to twenty-two cases of chronic simple glaucoma which he is treating locally with pilocarpine nitrate, and hot applications. Internally these patients get the "Reform Diet" and colon irrigations. None have as yet come to the operating table. We must not lose sight of the fact that glaucoma is not merely a local disease, that chronic simple glaucoma is the outcome in every instance of prolonged chronic autotoxæmia. The treatment of these glaucoma cases and the details of the diet will be published in full in a paper at a later date.

After five years experience with the "Reform Diet," Doctor Bell feels convinced of his stand in recommending it as a therapeutic measure in ophthalmic practice.

DISCUSSION: DR. R. H. ROSE stated that Dr. Bell in addition to impressing the Three T's, has, in an interesting and scientific way, stressed the importance of faulty diet as a cause of toxæmia.

The increase in the use of sugar from 9 to 90 pounds per individual in the past century means the derivation of one fourth to one sixth of the caloric value of our food from an article which, according to McCarrison, contains no vitamins, those originally in the sugar-cane being destroyed. Much of the other carbohydrates in use, such as refined cereals and flour products, is also lacking in vitamins and minerals. This is the reason the uncivilized are often better physically than the civilized.

One important point in Doctor Bell's diet is separation of heavy starches from heavy proteins. It has been long recognized (Hemmeter Strict Diet, page 196, 3rd Edition) that in hyperchlorhydria carbohydrate digestion is checked by HCL. Meat stimulates HCL, therefore interferes with digestion of carbohydrates, therefore take heavy starches when heavy proteins are not eaten.

A case of glaucoma seen with Dr. Bell corroborates his opinion. Some oculists had said the case was incurable. Removing an abscessed tooth, and placing him on a diet reduced tension to practically normal.

The author believes that high blood pressure is generally due to toxæmia. Its cause may often be found among the Three T's. It seems reasonable to put glaucoma in the same category.

DR. JOSEPH L. BEHAN said that the Reform Diet of Dr. Bell is a well balanced routine of feeding, according to his concept of the physiology of digestion.

Certainly, if proteids are mainly digested in the stomach, and carbohydrates chiefly in the intestines, either our physiology or nature is wrong. From birth our stomachs are accustomed to a mixture of proteids and carbohydrates, and by the time adult life is reached, if this physiology be correct, some adequate adjustment is made by the human machine whereby these unphysiologic food mixtures are tolerated, for surely the majority of the human race cannot be invalids.

He believes that the benefit derived from the Reform Diet lies, not so much in the restoration of digestion to within physiologic limits, as to the production of a systematized routine of feeding, and the replacement of artificial by natural foods. If for no other reason it is worthy of trial. He prefers to confine the ætiologic factor to the alimentary canal, to find the offending article of food and then prohibit its use. As regards the intestinal tract, his efforts are toward the production of the normal stool by the most natural means.

DR. W. E. DEEKS congratulated Dr. Bell on his Reformed Diet in the treatment of various ophthalmological diseases. The first work done along these lines was by Dr. Reeder and himself in the Ancon Hospital, Panama, during the years 1910 to 1914, when they obtained brilliant results in the treatment of inflammatory conditions of the fundus of the eye by the use of a diet in which all saccharose and excessive starchy foods such as pastry, sweets, desserts, pies, puddings and cereals were eliminated. They limited their patients to a diet consisting of all forms of meat, fish, cheese, eggs and milk preparations; all forms of green vegetables, cooked and uncooked, all

kinds of fresh fruits; and limited the amount of bread and potatoes.

The results of their experiences were discussed with Dr. Bell in 1916, and he was glad to note that Dr. Bell had advanced along the same lines and has gone even beyond what was anticipated.

He believed that the ætiological factors referred to in connection with the Three T's have back of them the use of excessive amounts of sweet and starchy foods. He had had no experience with glaucoma.

DR. A. E. DAVIS in discussion said that while he agreed with Dr. Bell in a great measure in what he said as to the regulation and limitation of diet in the treatment of certain diseases of the eye, he could not concur as to the exact method he recommended. To make any method of treatment effective, it must be so arranged that the patient will take the treatment recommended. He did not believe it possible to induce the majority of patients to eat all carbohydrates or starches at one meal, to the exclusion of fats and proteins; or vice versa, all proteins at one meal to the exclusion of starches. In other words, the method is impractical. A properly balanced mixed diet, in his opinion, would be just as easily digested and certainly more palatable.

Relative to the point made by Dr. Bell, that cases of chronic simple glaucoma do better on regulating their diet, than by operating on them, it is well known that this type of case, as a rule, does better without operation than with it, provided miotics are used at the same time. A regular diet alone will *not* control the glaucoma. He has had such case maintain their vision by the simple use of miotics for as long as 15 years, even without dieting the patient.

DR. A. J. QUIMBY referred to the importance of iodides in food, and discussed the several theories attempting to explain their physiological action.

DR. F. W. LANGSTROTH referred to the effect of pelvic disorders and infections as a source of ocular disease and appealed for closer observation and study of this relationship on the part of the oculist.

DR. BELL wished to thank Dr. Deeks for bringing to his attention several years before the question of sugars and sweets in diet.

In reply to Dr. Davis regarding acute inflammatory glaucoma, Dr. Bell claimed brilliant results with the same line of treatment followed in chronic simple glaucoma.

In reference to the stomach taking care of starches and proteids at the same meal, he stated that most people are sick at forty years of age or have had some serious operation. This he insists is due to the fermentation in the alimentary canal brought on by wrong food combinations (heavy starches and proteins). McCollum, he said, has proved in the laboratory with animals that this mixed diet is a failure.

BOOK REVIEWS.

I.—**Glaucoma et Glaucomateux.** Par V. MORAX, Ophthalmologiste de Lariboisiere, Librairie Octave Doin, Gaston Doin, Editeur, Paris, 1921.

This interesting work in sixteen chapters covers the subject of glaucoma in every detail in a manner to be justly expected at the hands of such a master as this author is known to be. The opening chapter takes up the definition and etymology of the term and then launches into a detailed history of the condition, and of the distinguished workers of bygone days in this field, mostly French. The second chapter has to do with the ocular tension and the means of accurately determining it. Twenty-five pages are given to illustrating the methods of taking the tension, the significance of each, and definite detail as to just how each method should be employed. The use of the fingers, the manometer, and the tonometer have their uses, but if a student or reader is left with a casual reference to these methods to guide him, his attempts to employ them or to interpret the findings of others employing them, will be far from satisfactory. Morax has appreciated this and has left nothing to the imagination. If we are to employ the fingers in the absence of instrumental means—there is a right way to do it. It is well shown here. In using the fingers we prefer the index fingers of both hands. The technic of the application of the Schiøtz tonometer is well illustrated. On the subject of physiology and pathology, the author writes at length, illustrating the text in a commendable manner. The symptomatology is well handled, and the colored plate showing the colored rings seen by the patient when looking at a light is especially good. The illustrations and text concerning glaucomatous excavation of the nerve head are conventional. The chapter on Infantile Glaucoma is

particularly noteworthy, and more than is usually given to that phase of the subject. Traumatic glaucoma is likewise considered at length and many apparently minor details are given proper emphasis. The several varieties of secondary glaucoma are described in detail and the description carries with it the earmarks of experience. In considering diagnosis and prognosis, sixteen chapters are consumed, and are in conformity with the high excellence of the rest of the book. In the treatment, eserin, pilocarpin, jaborandi, adrenalin, dionin, bromhydrate d'arecoline, and others are disposed of early, and then the surgical procedures are taken up in detail. Iridectomy and sclerotomy are described and then "Sclerotico-iridectomie"—the operation we like to include under the heading of Elliot's operation. The Lagrange technic of "sclerotico-iridectomie" is given in minute detail. Here the illustrations, however, tell the story much better than the text. Holth's technic, in which a scleral punch is used, is also given in full. Elliot's technic, using the trephine to remove a portion of the sclera instead of making a section of the sclera and then using scissors to excise the apex of the flap thus produced as in the Lagrange, is rather meagerly described although the pictures are fairly good. If the descriptions and pictures here given are to be taken authoritatively, it would appear that the Lagrange meets the indications far better than either the Holth's or Elliot's operation. However, these pictures, as do so many in this operation in other works, fail to show the disturbed relations of the swollen conjunctiva and subconjunctival tissues caused by the subconjunctival injections of cocain, or novocain, and adrenalin. In case the technic given fails to afford sufficient iridectomy he shows the use of the keratome for enlarging the scleral opening (after trephining operations) and excising more of the iris. After all, the principles of the Graefe iridectomy are the only reliable ones. The Lagrange operation appears to admit of greater reliability than the Elliot, largely on account of the size of the scleral incision and resection. As a choice Lagrange would doubtless be accepted.

I regret very much that the distinguished author has not alluded to the operation for glaucoma as carried out by Lt.-Col. Herbert, of Brighton, England, formerly of India. His

operation is known as the uniform linear iris-free filtration. The reviewer has had a great deal of experience in the iris free drainage and has obtained excellent results in reducing and keeping down the tension. He is not in sympathy with Herbert and Holth in the iris inclusive operation. After all has been said and done it is the hand of the operator that makes for success in any operative procedure in glaucoma.

The entire work is worthy of the advanced student's careful perusal.

L. WEBSTER FOX.

NOTICES

THE INTERNATIONAL CONGRESS OF OPHTHALMOLOGY (1925)

At the International Congress of Ophthalmology held in Washington in April, 1922, Mr. Treacher Collins presented an invitation on behalf of all the Ophthalmological Societies of Great Britain and Ireland to hold the next Congress in London in the year 1925. The invitation was accepted on the motion of Professor Gullstrand, of Upsala, Sweden, seconded by Dr. Lucien Howe, of Buffalo, New York. A general committee consisting of representatives of the inviting Societies has since met and has formed an executive committee, empowered to make arrangements for the 1925 Congress. It is to be held in London during the four days, Tuesday 21st to Friday 24th July. The three official languages are to be English, French, and German. The subscription for membership has been fixed at the sum of £2. Invitations will be sent to the principal Ophthalmological Societies or other representative bodies in every nation, asking them each to nominate a delegate to the Congress who would be responsible for promoting its interests in the country which he represents, so as to endeavor to make it a great reunion of all those interested in Ophthalmology throughout the world.

The Executive Committee is composed of the following members:—Mr. E. Treacher Collins, Chairman; Mr. J. Herbert Fisher, Vice-Chairman; Mr. Ernest Clarke, Treasurer; Mr. Leslie Paton, 29, Harley Street, London, W., and Mr. R. R. James, 46, Wimpole Street, London, W., Secretaries; Mr. A.B. Cridland; Mr. J. B. Lawford; Mr. Humphrey Neame; Sir John H. Parsons, F.R.S.; Mr. A. H. H. Sinclair.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

PRESIDENT: A. MAITLAND RAMSAY, M.D.

ANNUAL CONGRESS, 1923.

The next Annual Congress of the Society will be held on Thursday, Friday and Saturday, 26th, 27th and 28th of April, 1923, at the Royal Society of Medicine, 1, Wimpole Street, W. I.

The arrangements will be as follows:

MORNING. THURSDAY, APRIL 26th.

10 A.M. to 12.30 P.M. ... **President's Opening Address.**
 Papers:—Mr. R. AFFLECK
 GREEVES: "A Series of Con-
 secutive Cases of Cataract
 Extraction by Barracquer's
 Method."
 Mr. R. FOSTER MOORE: "A Ser-
 ies of Consecutive Cases of
 Cataract Extraction by Bar-
 racquer's Method."

AFTERNOON.

2.15 P.M. ... - ... Discussion on "The Disorders of
 the Blood and their Ophthal-
 mological Manifestations."
 To be opened by SIR HUM-
 PHRY ROLLESTON, K.C.B.
 (President of The Royal Col-
 lege of Physicians), SIR FRED-
 ERICK ANDREWES, F.R.S., and
 Dr. W. C. SOUTER. The follow-
 ing also intend to speak: —

EVENING.

5 P.M. Bowman Lecture. To be de-
 livered by Prof. GEORGE E.
 DE SCHWEINITZ (President of
 The American Medical Asso-
 ciation) on "Certain Ocular
 Aspects of Pituitary Body
 Disorders, mainly exclusive
 of the usual Central and Peri-
 pheral Hemipic Field
 Defects."
 Members will dine together in
 the evening.

MORNING. FRIDAY, APRIL 27th.

10 A.M. Discussion on "The Diagnostic
 Significance of Proptosis." To

MORNING.

FRIDAY, APRIL 27th—Continued

10 A.M. be opened by Mr. WILFRED TROTTER, Mr. HERBERT FISHER and Dr. ANGUS MACGILLIVRAY. The following also intend to speak: Mr. PERCY FLEMMING, —

AFTERNOON.

2.15 P.M. Visit to The London Hospital, Whitechapel.

Clinical Meeting. Members are invited to show cases of interest.

The Hospital will be open for inspection, and the Medical Staff will contribute exhibits.

EVENING.

8.30 P.M. Demonstration by Members.

MORNING.

SATURDAY, APRIL 28th.

10 A.M. Business Meeting.

Papers:—Dr. ANGUS MACGILLIVRAY: "Enucleation of the Eyeball under Local Anæsthesia."

N.B.—Members having specimens illustrating any of their papers are invited to bring them for demonstration.

Members desirous of reading Papers, showing Cases, or taking part in the Discussions, are requested to communicate as soon as possible with Mr. R. FOSTER MOORE, 91 Harley Street, W. 1.

Papers and Communications, subject to the judgment of the Council, will be printed in full in the *Transactions*.

Under the By-laws readers of Papers must not exceed twenty minutes, subsequent speakers ten minutes. The openers of the Discussions are allowed twenty minutes.

All Communications must be type-written.

J. F. CUNNINGHAM }
R. FOSTER MOORE } *Hon. Sec.*

ARCHIVES OF OPHTHALMOLOGY.

PRIMARY GLIOMAS OF THE CHIASM AND OPTIC NERVES IN THEIR INTRACRANIAL PORTION.¹

By DR. PAUL MARTIN (BRUSSELS) and DR. HARVEY CUSHING (BOSTON).

(With forty-two illustrations on Text-Plates VIII.-XXVI.)

THIS paper is concerned with the report of seven tumors, all of them gliomas which appear to have originated either in the chiasm or the optic nerves adjacent to it. In only one instance (Case VII), and then because of a coexistent disorder, was the probable source of origin and character of the lesion surmised before the actual condition was brought to light. Though a correct localizing diagnosis of a suprasellar lesion had been made in all but two of the patients (Cases I and V), a tumor of hypophysial or pharyngeal-pouch origin was looked for with secondary involvement of the chiasm through pressure.

Ophthalmic surgeons have long been familiar with the gliomas originating, or appearing to originate, from the optic nerves in their intraorbital portion, and the tradition prevails

¹ The basis of a clinical demonstration before the New England Ophthalmological Society held at the Peter Bent Brigham Hospital, November 20, 1922. Among the patients showing primary optic atrophy were two that had recently been operated upon—Case VII of the present series with a verified chiasmal glioma, and another a child with a verified tumor of the craniopharyngeal pouch. It was agreed that the ophthalmoscopic appearance of the atrophic nerves in the two patients was undistinguishable.

that these tumors are not particularly malignant or at least of very slow growth, and do not tend to recur in the orbit after removal.

The literature of the subject is extensive and in our present connection stress will be laid on only two points which become evident from its perusal—(1) the confusion in terminology and, (2) the frequent involvement in the growth of the intracranial portions of the nerves and the chiasm. Thus in the earliest recorded example, a neuroma nervi optici reported by Hegmann in 1842, the tumor extended to the chiasm. The first case in which an intraorbital enucleation was attempted (that of Ritterich in 1861 for a "sarcoma" of the nerve) resulted in a fatality, and at autopsy an enormous enlargement of the chiasm was found. Likewise among other early cases surgically treated were three reported by von Graefe,¹ a sarcoma myxomatodes (1864), a myxoma (1864) and a glioma (1866). The last of these reports concerned a child aged six with exophthalmos due to tumor of the nerve which led to operative removal of the globe and partial extirpation of a retrobulbar tumor. Meningitis followed, and the autopsy revealed what was termed by Virchow a "glio-sarcoma" involving the intracranial portion of both optic nerves, chiasm and base of brain.

These early disclosures do not appear to have greatly impressed those who have subsequently written upon the subject, for the literature is almost wholly confined to the description of cases characterized by an extensive intraorbital tumefaction with its accompanying exophthalmos. Moreover, there has been such confusion regarding the histogenesis of these lesions taken as a whole, that many writers have made no serious attempt to distinguish the true tumors of the nerve from those which arise from its meningeal sheath—for the most part endotheliomas or meningiomas² as we prefer to call them.

One of the better known of the early articles on the subject

¹ Graefe. "Zur Casuistik der Tumoren." *Arch. f. Ophth.*, 1864, x., 1., 193 and 201. *Ibid.*, 1866, xii., 2, 100.

² Cushing H. "The Meningiomas (Dural Endotheliomas). Their Source and Favored Seats of Origin." *Brain* (London), 1922, xlv., 282-316.

is that by Leber's pupil Willemer,¹ who in 1879 assembled from the literature the reports of twenty-five cases of most variable histology, though many of them doubtless represented true gliomas of the nerve. To these he added the histories of two cases from Leber's clinic, one of which relates an experience similar to that which had befallen von Graefe's patient mentioned above, namely meningitis following an intraorbital enucleation of what was termed a myxosarcoma of the nerve. Here again the autopsy showed an unsuspected intracranial extension of the growth which not only involved the chiasm but the other optic nerve as well.

At that day there was such a degree of hair-splitting in matters of histopathological nomenclature that many lesions of unquestionably the same histogenesis were given a variety of qualifying designations, and there can be little doubt that some (Verhoeff thinks the majority) of these so-called myxosarcomas were of the same nature as the tumors we have under consideration. In its gross appearance, at all events, the chiasmal tumor which Willemer pictures (*loc. cit.* Table VI, Fig. 12) bears unmistakably a close resemblance to the chiasmal gliomas we have encountered.

From Willemer's time we may pass without reference to the many intervening publications, to another notable study of the subject, with the analysis and assemblage of all previously recorded cases, made in 1912 by Arthur C. Hudson,² then curator of the Royal Ophthalmic Hospital. Like other ophthalmic surgeons, Hudson approached the subject from the standpoint of the intraorbital tumors and included in his discussion those arising from the sheath as well as those of the nerve proper. However, he considerably simplified their classification by dividing them into three groups—tumors showing gliomatosis, fibromatosis, and those of endothelial origin. The two latter groups, representing tumors which arise from the nerve sheath or its meningeal envelopes do not here concern us, but of the former, those exhibiting glial

¹ Willemer, W. "Ueber eigentliche d. h. sich innerhalb der äusseren Scheide entwickelnde Tumoren des Sehnerven." *Arch. f. Ophth.*, 1879, xxv., 161-247.

² Hudson, A. C. "Primary Tumors of the Optic Nerve." *Royal London Ophthalmic Hosp. Rep.*, 1912, xviii., Part III, 317-439.

proliferation, Hudson assembled and tabulated 118 cases, the larger number of which had been originally described as myxosarcomas of one form or another.

What is of major interest to our present topic is the fact brought out in the author's tabulation that in all but one of the eleven cases in which there was a postoperative fatality with subsequent autopsy, an extensive intracranial involvement of nerves and chiasm, often with more or less invasion of the brain, was the invariable post-mortem finding. Moreover, it is evident that in fourteen other instances, symptomatic evidence of intracranial disease had already appeared by the time the cases were reported.

Though Hudson was well aware of the fact that the tumor need not be confined to the orbital position of the nerve but may extend into the cranial cavity, his tabulation of these 118 cases nevertheless makes it clear that after the removal of the intraorbital lesion local recurrence is surprisingly rare and patients may remain free from symptoms for many years. Hence, granting accuracy of diagnosis, it is evident either that certain of these gliomas may take their origin in and remain confined to the intraorbital portion of the nerve, or else that the lesion may be so slow in its growth as to allow a long lease of life. In view of this one is forced to consider the possibility that there may be gliomas of different types—relatively malignant and relatively non-malignant varieties of what Hudson terms gliomatosis, for he hesitates to use the designation glioma. And in this connection it is necessary to mention that the neurofibromatosis of von Recklinghausen, a comparatively benign process, may have been the underlying factor in some—perhaps in many—of the recorded cases with a particularly favorable surgical outcome.

The possible relation of these tumors to generalized neurofibromatosis has engaged the attention of several who have written on the subject and has led to considerable controversy. One of the chief proponents of this view was Emanuel,¹ who in 1902 laid particular stress on this association.

It is well known that multiple cranial-nerve tumors may

¹ Emanuel, C. "Ueber die Beziehungen der Sehnervengeschwülste zur Elephantiasis neuromatodes und über Sehnervengliome." *Arch. f. Ophth.*, 1902, liii., 129-161.

accompany outspoken examples of von Recklinghausen's disease, but of all the nerves the optic are perhaps the least often involved in the process. The acoustic nerves, on the other hand, are far more commonly affected—indeed are usually affected singly and oftentimes in the absence of any other recognizable manifestation of neurofibromatosis elsewhere in the body. These tumors, however, are of such distinctive pathology they can hardly be confused with any other variety of neoplasm. Emphasis is laid upon this because in Case VII of our present series, though the patient evidently was a victim of generalized neurofibromatosis of mild degree, the chiasmal tumor was rich in glia fibrils. These are wanting in the true acoustic "neurinoma" which possesses, in other respects also, an unmistakable histological architecture.

By far the most important contribution to the subject from our present standpoint has recently been made by F. H. Verhoeff.¹ He has given a detailed study of eleven examples of what he calls primary intraneural tumors of the optic nerve, all of them, however, with the possible exception of De Schweinitz's case having been tumors supposedly restricted to the intraorbital portion of the nerve. Though he mentions that an intracranial extension of these tumors is possible, he states that "recurrence after incomplete removal of the orbital tumor has never been recorded." Verhoeff's chief attention was paid to the histopathology of the lesions, and while emphasizing their extreme rarity he stresses the fact that the primary intraneural tumors of the nerve reported as myxomas, myxogliomas, or myxosarcomas by his predecessors in the earlier literature, have probably all been gliomas.

It is natural enough that the ophthalmic surgeon should have been chiefly concerned with tumors which have originated in or have come to involve the optic nerve in its orbital portion with the usual concomitant of an exophthalmos. On the other hand, neuro-surgeons, owing largely to their intracranial pursuit of hypophyseal tumors, have of late years come

¹ Verhoeff, F. H. "Primary Intraneural Tumors (Gliomas) of the Optic Nerve." *Arch. f. Ophth.*, 1922, li., 120-40; 239-54. Dr. Verhoeff's paper richly deserved the Knapp prize which was awarded for it, and it may be recalled that Herman Knapp in 1879 reported one of the early cases of glioma of the optic nerve.

frequently to expose the region of the chiasm in their operative procedures, and reports of their experiences have begun to appear in the literature.

In neurological parlance, tumors in this region are generally referred to as suprasellar or as interpeduncular tumors. Having a characteristic symptomatology they are, generally speaking, easily recognized; but on the whole we stand in relation to them in much the same position that a few years ago we stood in relation to the tumors occupying the cerebellopontile angle. Neurologists for the most part were satisfied to localize a lesion in the lateral recess and rarely ventured before operation to foretell its pathological nature. Happily, we do much better than this today. And in like fashion, now that the localizing symptomatology of the suprasellar lesions is well understood, it behooves us to take a forward step and, so far as possible, to anticipate before operating, the morbid nature of the process.

Primary optic atrophy, visual-field distortions, deviations from the normal in the profile configuration of the sella, suprasellar shadows, oculomotor palsies, diabetes insipidus, somnolence, and so on, as well as the constitutional evidences of secondary pituitary involvement, constitute, when taken together, a symptom-complex pointing unmistakably to the suprasellar region. But given a primary optic atrophy, often with accompanying temporal-field defects as the essential basis of the localizing diagnosis, we have reached the stage at which it is possible with some exactitude to differentiate a few at least of the many tumors which may occur in this neighborhood, perhaps the most common site of intracranial-neoplasms.

There are various ways of exposing the suprasellar region, the anterior rather than the lateral route being very much favored in this clinic. It, however, is not our purpose to discuss the relative merit of these two routes for operative methods naturally vary in different hands. It may suffice to say that the mortality for these osteoplastic procedures is very low,¹ and that in the majority of cases an excellent view of the region from directly in front and without damage to

¹ In the Brigham Hospital series there have been at this writing (December 8, 1922) 84 transfrontal operations on 72 patients, with six post-operative fatalities, two of them having occurred in this small glioma series.

the brain can be secured. Whatever may be the favored method of approach, the chief difficulties are two—(1) in dealing effectively and permanently with a surgically removable lesion if it has reached a large size before its exposure, and (2) in the differentiation from the others of the pathologically inoperable lesions of the neighborhood like those under immediate consideration—the chiasmal gliomas.

Gliomas which originate elsewhere than in the chiasm are, to be sure, not uncommon in this neighborhood—those from the perforated space, the floor of the third ventricle, the infundibulum, or even the posterior lobe of the hypophysis; but these tumors in our experience do not tend to invade the chiasm; are more likely in the course of their development to produce a choked disk than a primary atrophy; and, though a number of these cases are recorded in our tumor series, they have been excluded as irrelevant to this particular study.

What may be the general run of the suprasellar tumors encountered in the course of neurosurgical operations can be gathered by an article of two years ago by George J. Heuer, who reported¹ a series of twenty-eight surgically verified "chiasmal lesions" of which twenty were hypophysial adenomas, three were craniopharyngeal duct tumors, four were said to be gliomas of the perforated space or base of the brain, and one a sarcoma arising from the optic nerve sheath. None of the cases in his series, therefore, would appear to have been of the type under consideration, but in answer to a letter of inquiry Dr. Heuer writes that one of the cases, classified as a "glioma of the base of the brain," was unquestionably a primary chiasmal tumor. The patient, aged twenty-one, had a progressive loss of vision for several years and on admission was blind in the left eye and showed an imperfect temporal hemianopsia in the other. A diagnosis of suprasellar tumor was made but at operation a tumefied chiasm was disclosed. On the left side a pedunculated nodule of tumor had broken through the outer bundles of fibres. This was removed for study and pronounced a glio-fibro-

The others resulted from consecutive efforts to deal successfully with large calcareous tumors originating from Rathke's pouch.

¹ Heuer, G. J. "Surgical Experiences with an Intracranial Approach to Chiasmal Lesions." *Arch. Surg.*, 1920, i., 368-81.

sarcoma by the pathologist, though Dr. Heuer regarded it as a glioma. The patient survived for four years. The case is of interest in showing how these tumefactions which appear for a long time to be restricted to the nerves or chiasm may ultimately extend beyond these confines.

In 1921 W. L. Lillie of the Mayo Clinic recorded, chiefly from the ophthalmological point of view, a series of six suprasellar tumors.¹ His second case may possibly represent one of these chiasmal gliomas, but the description is not given in sufficient detail to make this certain, though a glioma into which the optic nerve disappeared was disclosed by A. W. Adson at operation.

More recently W. E. Dandy² has called attention to the fact we also desire to emphasize, namely that a large number of intraorbital optic-nerve tumors will be found to involve the intracranial structures. However, the two cases he reports are both examples of the more common endotheliomas of the nerve sheath, and we feel that he is over-enthusiastic regarding the operability of the gliomas which are evidently included in his subsequent generalizations regarding these lesions which he terms "prechiasmal."³

In order to gain some idea of the prevalence of these chiasmal gliomas some figures may be given from the records of the Brigham Hospital clinic. At the time of this writing the series contains 826 histologically verified intracranial tumors of which 345 are gliomas of various types and regions, representing therefore 41.7 per cent. of intracranial tumors taken as a whole. The seven chiasmal tumors included in this report consequently represent only two per cent. of all the 345 gliomas and only 0.84 per cent. of all verified tumors⁴.

¹ Lillie, W. L. "Ocular Phenomena of Chiasmal Lesions Not of Pituitary Origin. Report of Six Cases." *Surg. Clinics of N. America*, 1921, i., 1363.

² Dandy, W. E. "Prechiasmal Intracranial Tumors of the Optic Nerves." *Am. J. Ophth.*, 1922, v., 169-188.

³ Certainly the gliomatous tumors which appear to originate in the chiasm have not as yet been observed or recognized by neuro-surgeons, if one may judge from the replies to letters of inquiry which have kindly been sent us.

⁴ Two other possible examples have not been included in this paper because the pathological material is not available for reinvestigation in our

For convenience of regional rather than pathological study a separate classification of our tumor cases is kept up to date. This includes a series of 233 verified tumors arising from or near the hypophysis and which have affected the chiasm by direct pressure. These may be tabulated as follows:

Hypophysial adenomas of all types.....	164
Cranio-pharyngeal pouch tumors.....	38
Endotheliomas.....	13
Interpeduncular gliomas.....	13
Teratomas.....	3
Epidermoid cholesteatomas.....	2

In this regional tabulation the suprasellar as well as the intrasellar lesions have been incorporated and among the thirteen interpeduncular gliomas the seven chiasmal tumors were included. They thus represent on this regional basis slightly less than three per cent. of all the tumors found in the hypophysial neighborhood which are likely to affect the chiasm by pressure and cause primary optic atrophy.¹

By far the larger number of the 233 verified lesions included in this hypophysial and parhypophysial group have been intrasellar hypophysial adenomas with a greatly enlarged pituitary fossa. In this clinic these cases have for the most part been operated upon by a transphenoidal procedure, which of course does not expose the chiasm. However, in seventy-two cases a transfrontal operation has been performed for lesions obviously suprasellar in their situation, and the region of the chiasm brought into view. In eleven of these cases the nature of the lesion was not identified. In the sixty-one cases which were histologically verified the conditions tabulated below have been encountered.

present connection. One of them was autopsied elsewhere, and in the other case the coronal brain-slab comprising the tumor, after sections showing glioma were taken, has been mislaid. In all probability, however, judging from the photographs both are also chiasmal tumors, but they have been excluded on the grounds of an imperfect topographical description, for the lesion may possibly have originated in the third ventricle and spread into the chiasm.

¹ Thus in the series of Heuer and Dandy (*loc. cit.*), in which an intracranial operation was done for all tumors of the region, including the primarily intrasellar adenomas, one presumable chiasmal glioma was identified in 28 cases; = 3.5 per cent.

	<i>Cases</i>
1. Tumors of craniopharyngeal pouch.....	27
2. Suprasellar endotheliomas.....	9
3. Hypophysial adenomas.....	8
4. Adenomatous cysts.....	5
5. Chiasmal gliomas.....	5
6. Arachnoiditis circumscripta.....	3
7. Epidermal cholesteatomas.....	2
8. Gliomas of IIIrd ventricle (?).....	2
	<hr/> 61

This table would indicate that about eight per cent. of explorations of the suprasellar region for lesions provoking the usual local symptomatology would reveal chiasmal gliomas. If, however, we should include in this calculation the entire group of these suprasellar lesions recorded in the series, embracing the tumors which have been approached in other ways than by a transfrontal operation or which have been unexpected post-mortem findings, the percentage would fall much lower—indeed to approximately three per cent. if, as stated above, the adenomas are all included.

The five examples of chiasmal glioma included in the preceding table and the two others (Cases I and V) which were first disclosed at autopsy, will be presented chronologically in the order of their admission to the clinic.

CASE I.—P. B. B. H. Surg. No. 3951. *Pineal tumor "suspect": internal hydrocephalus: palliative operation. Death a year later. Autopsy: glioma of the optic chiasm.*

December 3, 1915.—Admission of John S., age 4½, referred by Dr. G. S. Derby of Boston, with complaint of loss of vision, polyuria and polydipsia.

Family history without interest except that the mother has a goiter.

Past History.—Early in life the child was treated for rickets presumably because of its prominent forehead. When he was one and one half years old he fell downstairs, hitting the top of his head; he vomited and was sick for three days. Since then there has been no vomiting nor headaches. His development was retarded and he did not walk until four years of age. He has been intellectually backward with slow development of speech, and even now he says only a few words and has a peculiar gibberish of his own. He has been taking thyroid extract during the

ILLUSTRATING DR. PAUL MARTIN AND DR. HARVEY CUSHING'S
ARTICLE ON "PRIMARY GLIOMAS OF THE CHIASM AND
OPTIC NERVES IN THEIR INTRACRANIAL PORTION."

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Fig. 1. Case I. Child with low grade of hydrocephalus and blindness. Cause not recognized during life.



Fig. 2. Case I. Showing (as now interpreted) sella turcica (slightly tilted) with apparent extension under the anterior clinoids attributed to dilatation of optic foramina (O. F.).

ILLUSTRATING DR. PAUL MARTIN AND DR. HARVEY CUSHING'S ARTICLE ON "PRIMARY GLIOMAS OF THE CHIASM AND OPTIC NERVES IN THEIR INTRACRANIAL PORTION."

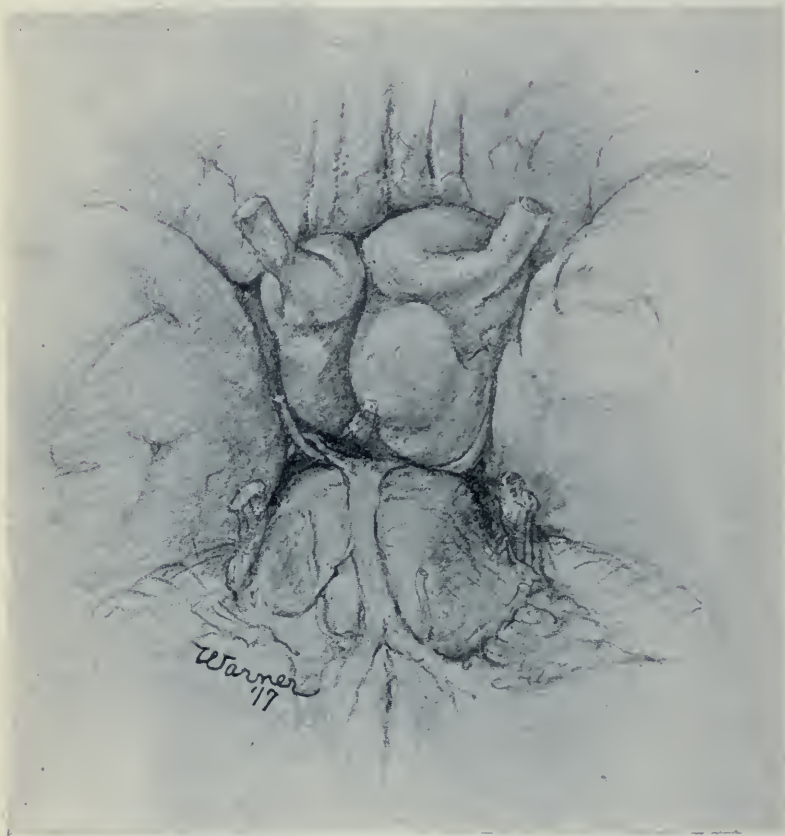


Fig. 3. Case I. Sketch of interpeduncular region (nat. size) showing the markedly enlarged chiasm and the coiled optic nerves. The stalk of the pituitary body is seen lying between the bases of the tumor.

ILLUSTRATING DR. PAUL MARTIN AND DR. HARVEY CUSHING'S
ARTICLE ON "PRIMARY GLIOMAS OF THE CHIASM AND
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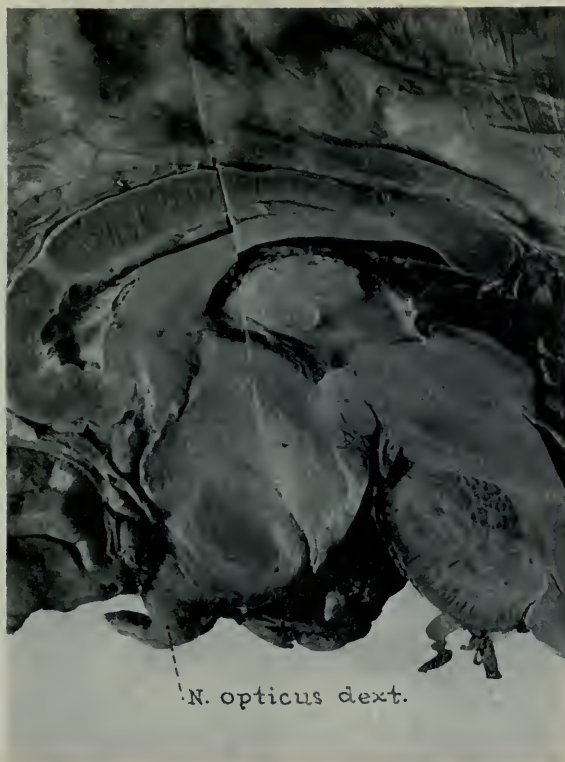


Fig. 4. Case I. Sagittal section of brain (nat. size) showing the tumor extending up in the region of the third ventricle. The right optic nerve thickened at its base is seen emerging from the tumor.



Fig. 22. Case IV. Photograph of patient on discharge, showing the well-healed scar of transfrontal operation.

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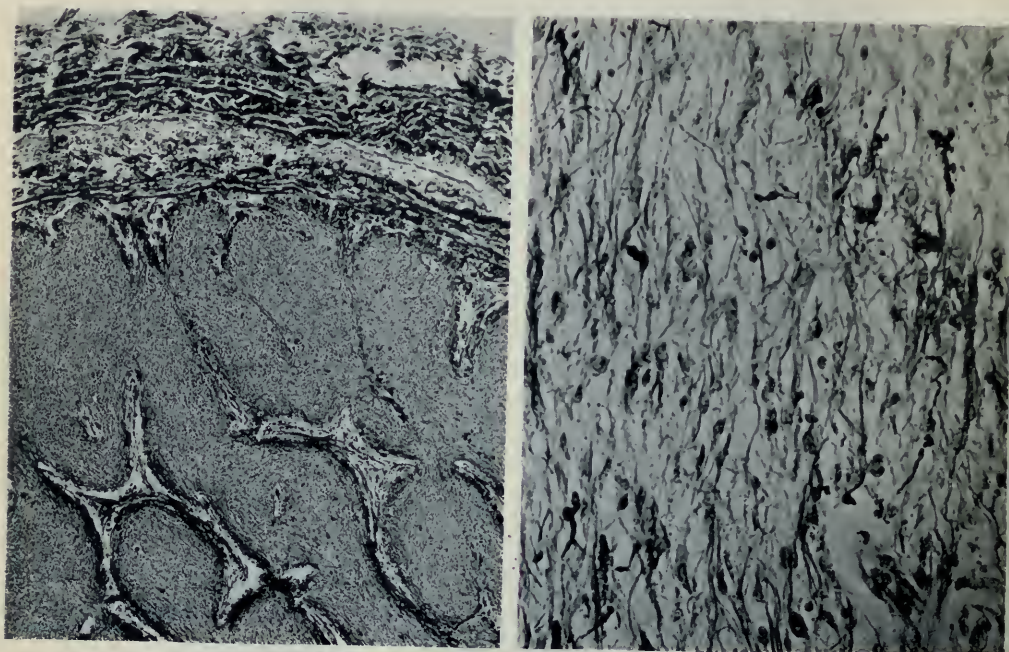


Fig. 5 (A and B). Case I. Section A (mag. x 80) across involved nerve showing extent of gliosis. Section B (mag. x 300) shows the characteristics of the chiasmal tumor: neuroglial cells and fibrils with cytod bodies.

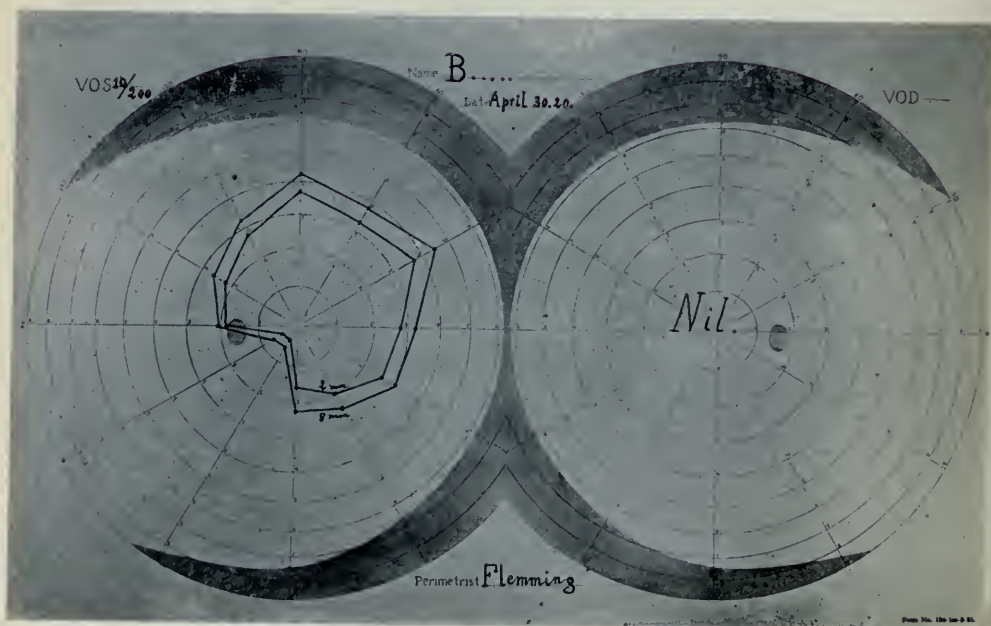


Fig. 6. Case II. Fields of vision showing to small disks a quadrantal defect on the left.

past year. Under this treatment his mentality and gait are said to have greatly improved.

Chronology of Symptoms.—Polydipsia for two or three years. Marked increase in vigor and stature for eighteen months. Loss of vision, change in disposition, polyphagia and polyuria for five months.

Positive Neurological Findings.—Child tall and strong for his age. Height: 117 cm. (normal 100). Weight: 27 kilos (normal 16). Head noticeably large (cf. photo, fig. 1). Bilateral optic atrophy regarded as secondary with near blindness. Perimetry impossible from lack of coöperation. X-ray of the cranium shows convolutional thinning suggesting hydrocephalus with no noticeable abnormality of the sella.¹ (Fig. 2).

A tentative diagnosis was made of possible pineal tumor, based largely on the boy's unusual stature. In view of the hydrocephalus a callosal puncture was performed on December 20, 1915, and he was discharged a month later.

Subsequent Note.—For ten months there was said to have been marked improvement in the child's mental condition, but this is only from hearsay. At the end of this period he began to refuse nourishment and died December 7, 1916. An autopsy was permitted.

Pathological Note.—The external aspect of the brain shows a large bulbous tumor mass filling the interpeduncular space, measuring about 3 x 3 cm. The growth appears to have originated in the chiasm, and out of it the thickened optic nerves coil in ram's horn fashion as shown in the accompanying sketch (Fig. 3).

A longitudinal mid-section discloses a moderate grade of internal hydrocephalus with no apparent cause. The pineal gland appears to be normal. The interpeduncular growth extends upward, crowding the third ventricle above it. (Fig. 4.) In the lower part of the tumor thus sectioned one can make out many of the transversely cut and widely separated fibers of the chiasm.

It would be difficult from this section to be certain whether the growth primarily arose in the chiasm and subsequently invaded the third ventricle, or the reverse, but the appearances greatly favor the former view. The stalk of the pituitary body was originally apparent (cf. Fig. 3), lying between the nates of tumor. This was lost on making the section.

Histological Note (Dr. S. B. Wolbach).—The tumor is

¹ The plate as at present reinterpreted, even though not a direct lateral view, shows, unmistakably, the enlarged optic foramina with overhanging anterior clinoids. Sphenoidal cells undeveloped.

composed almost entirely of neuroglia tissue, apparently traversed by bundles of myelinated nerves. The phosphotungstic-acid-hematoxylin stain shows fibrils to be very abundant and the cells mostly of the spindle cell type. Many of the cells show peculiar hyalin degeneration resulting in globoid masses of hyalin material and chains of globules. There are also rod-like hyalin bodies, evidently formed within cells; such as Verhoeff has described in gliomas of the orbit. From the homogeneous structure of the tissue, one must conclude that it is a glioma (Fig. 5B).

Cross sections of the optic nerves show that they have been almost entirely replaced by neuroglia. The general architecture is preserved (Fig. 5A) and the neuroglia at the periphery of the nerve bundles in most places possesses the usual arrangement of tangential and radial fibrils seen on the surface of normal nerve tissue. Here and there one can make out cross sections of myelinated nerves. There are occasional corpora amylacea in the tissue. There is some irregular extension of neuroglia into the dura.

Diagnosis.—Glioma of chiasm with gliomatous invasion of optic nerve.

Comment.—As stated, a half-hearted clinical diagnosis was made in this case of a pineal syndrome with secondary internal hydrocephalus. This the autopsy did not confirm and the degree of hydrocephalus was less than expected. In view of the post-mortem findings it is difficult to see how the callosal puncture could have possibly influenced the child's condition, and the hydrocephalus was probably a coincidental affair which bore no relation to the chiasmal tumor unless possibly they both are traceable to some congenital fault. Evidently those having the case in charge were misled in their interpretation of the ophthalmoscopic appearances of the optic nerves or else as in Case V the gliosis may have extended to the disks which so altered their appearance as to suggest choking. Unfortunately the intraorbital portions of the nerves were not secured at autopsy. The tumor is of the same histological type as that of Cases VI and VII.

CASE II.—P. B. H. Surg. No. 12320. *Presumed suprasellar tumor. Transfrontal exploration. Removal of tumefied segment of right optic nerve. Death six months later.*

April 24, 1920.—Admission of Lawrence A. B., age 25, a coastguard referred by Dr. M. E. K. Sprague of the

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Fig. 7. Case II. Sella turcica showing no apparent abnormalities.

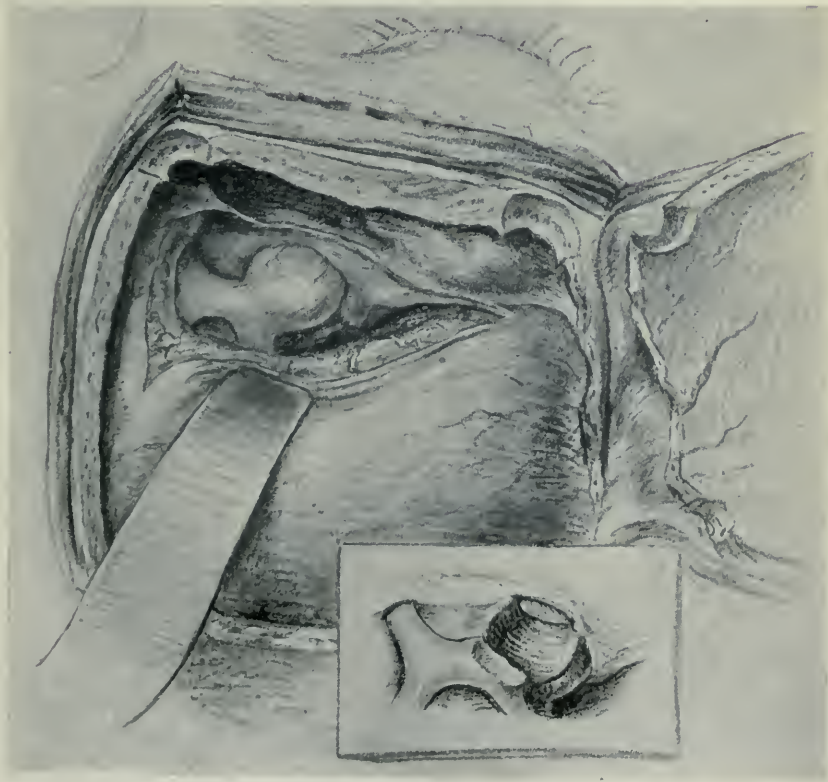


Fig. 8. Case II. Operative sketch showing the exposure of the tumefied portion of the right optic nerve. Insert shows the appearance after the resection.

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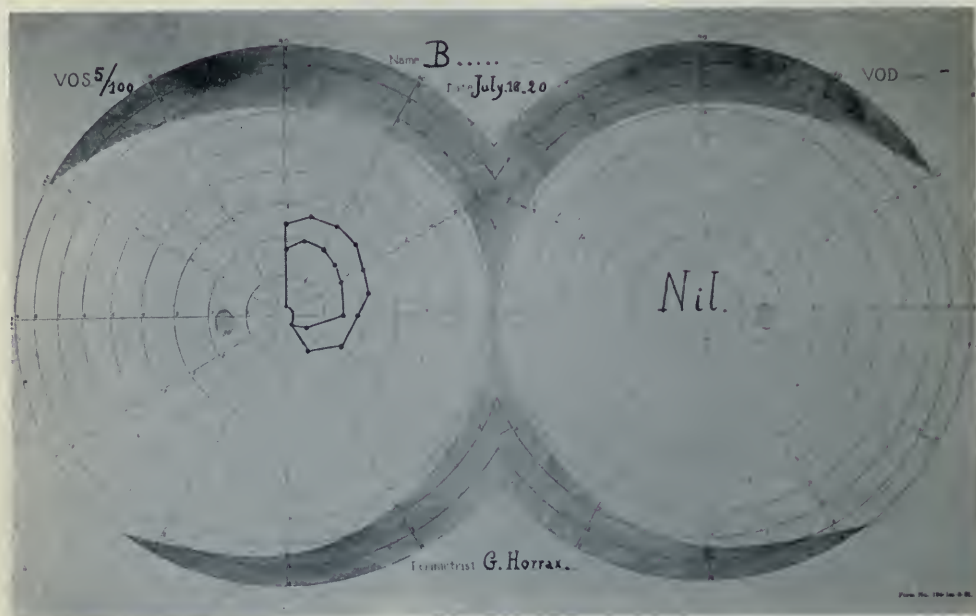


Fig. 10. Case II. Fields of vision taken two months after operation, showing the constriction of the fields and complete hemianopsia.



Fig. 9. Case II. Patient on discharge, showing inconspicuous scar of incision for trans-frontal exploration.

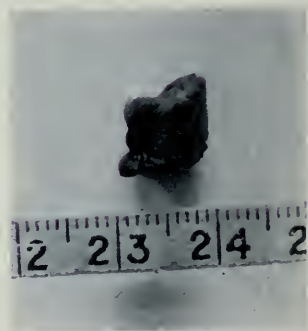
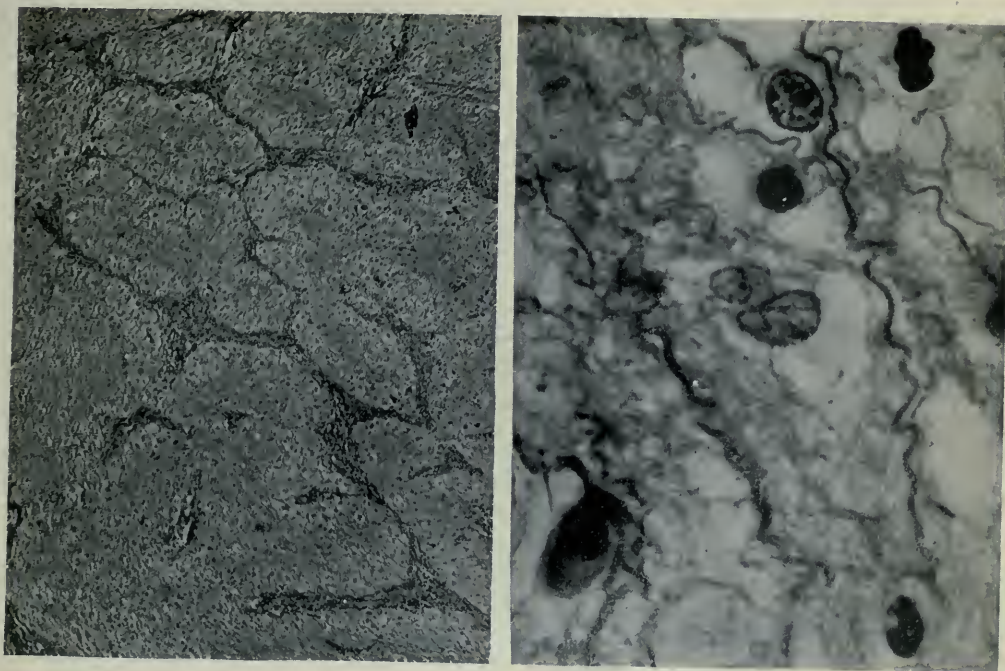


Fig. 11. Case II. Showing segment of enlarged nerve removed at operation.

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Figs. 12 and 13. Case II. Low-power section (x 80) on the left shows bands of connective tissue representing the normal fascicular architecture of the nerve, the intervals between them occupied by typical gliomatous tumor. The high-power section (x 1500) on the right shows neuroglial cells and fibrils.

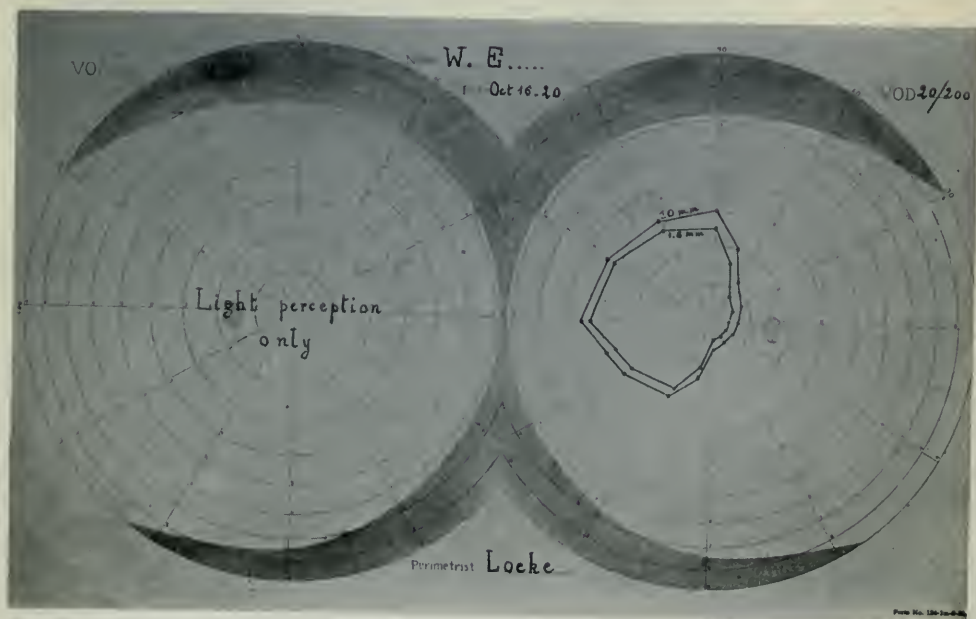


Fig. 14. Case III. Fields of vision taken on admission showing incomplete right temporal hemianopsia.

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Fig. 15. Case III. X-ray showing what was regarded as a normal sella with under-developed sphenoidal cells. Stereoscopically the characteristic undermining of the anterior clinoids from dilatation of the optic foramina is apparent at point indicated.

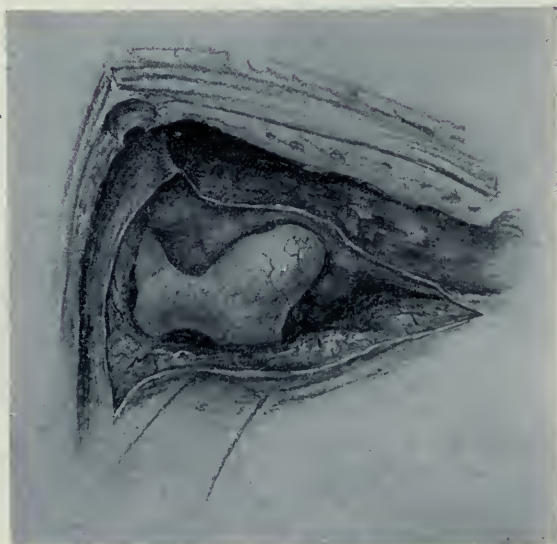


Fig. 16. Case III. Operative sketch showing tumefied right optic nerve and chiasm.

Chelsea Marine Hospital, complaining of loss of sight in right eye. Family and past history unimportant.

Chronology of Symptoms.—Onset four months previous to admission with slight blurring of vision in the right eye. Four weeks before admission vision began to fail on the left; for three weeks complete blindness on the right, with increasing impairment on the left. No headaches, nausea, or vomiting.

Neurological Findings.—Primary optic atrophy; bilateral. Blindness on right with immobile pupil. To the perimeter the left eye shows constriction with defect in the left lower quadrant (Fig. 6). V. O. S. $\frac{1}{200}$. Neurological examination otherwise negative. The X-ray showed what may be regarded as a normal sella (Fig. 7).

Preoperative Diagnosis.—Suprasellar tumor, probably craniopharyngeal cyst originating from Rathke's pouch.¹

May 5, 1920.—Operation (Cushing).—The usual trans-frontal approach disclosed a tumefied enlargement of the right optic nerve. Left optic nerve possibly somewhat swollen and more grayish in color than usual. The enlarged nerve, as shown in the operative sketch (Fig. 8), was first scooped out of the optic foramen and then cut off just at the margin of the chiasm.

Postoperative Notes.—Patient discharged May 20th in good condition (Fig. 9). No alteration in vision. He subsequently had a series of deep X-ray treatments in the hope that the process might be stayed. On the last of his visits, July 16, 1920, his vision still remained $\frac{1}{200}$, but there was now a complete temporal hemianopsia with further contraction of the fields (Fig. 10). He then drifted into other hands. Death occurred *October 18, 1920*, six months after operation. He had become blind and there were said to have been evidences of intracranial advance of the disease. No autopsy.

Histological Note (Dr. S. B. Wolbach).—The sections taken from the fragment of tissue (Fig. 11) show a tumor of unusual appearance composed of large cells with epithelial

¹ The terms "craniopharyngeal pouch" and "Rathke's pouch" as used by the authors in this paper are synonymous. It was Rathke who first described the pharyngeal pouch which is the embryological source of origin of the anterior lobe of the pituitary body. This pouch in the course of its development comes to embrace the infundibulum projecting from the brain which makes the posterior lobe of the hypophysis. As a result of this complicated formation, congenital tumors not infrequently arise. They are for the most part suprasellar and cystic. The epithelial cells become keratinized and calcareous deposits take place in them, shadows of which are usually capable of detection by the X-rays. (Ed.)

characteristics without definite arrangement, here and there grouped in areas of considerable size, separated from one another by bands of rather delicate connective tissue in which are many lymphocytes. At the periphery of the tumor there is a considerable layer of circularly arranged fibrous tissue, probably from the optic nerve sheath. In the peripheral portion there are groups of cells of large size mostly with circular outline but occasionally with processes. Here and there are large multinucleated giant cells which contribute to the resemblance that these foci have to tubercles, but there is no necrosis. In the central portion of the section the cells are closely packed so that their outlines in most instances cannot be made out, and a large portion of the cells have a finely granulated cytoplasm. Mitotic figures are numerous. In addition to the multinucleated giant cells which have the appearance of foreign body giant cells, there are large cells with prominent nuclei. With the phosphotungstic-acid-hematoxylin stain there are areas in the tumor in which wavy fibrils are very abundant. (Fig. 13.) These fibrils stain a deep blue and are continued along the processes of the tumor cells after the fashion of neuroglial fibrils. Even the cells with the vesicular cytoplasm and the very large mononuclear cells, and occasionally cells with two nuclei are associated with these fibrils. In the giant cells of the foreign body type there are very many densely staining blue granules which are interpreted as myelin residue. There are areas in the tumor of necrosis and to this is attributed the presence of collections of lymphocytes and eosinophiles. No normal nerve fibers recognized.

Diagnosis: glioma.

Comment.—The operation served merely to disclose an unsuspected glioma of the optic nerve and chiasm in a comparatively early stage of the process. Somewhat at a loss to know what further surgical step should be taken, if any, the tumefied portion of the more affected nerve was removed. The left optic nerve, although found swollen, grayish and evidently involved, was of course left in place, for a surgeon could hardly bring himself to remove the entire chiasm under these circumstances, even had there been some prospect of completely removing the lesion, thereby assuring a cure even at the expense of immediate and permanent blindness.

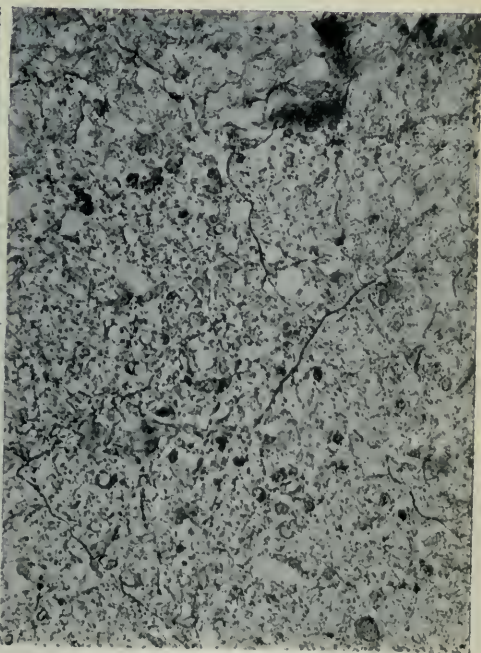
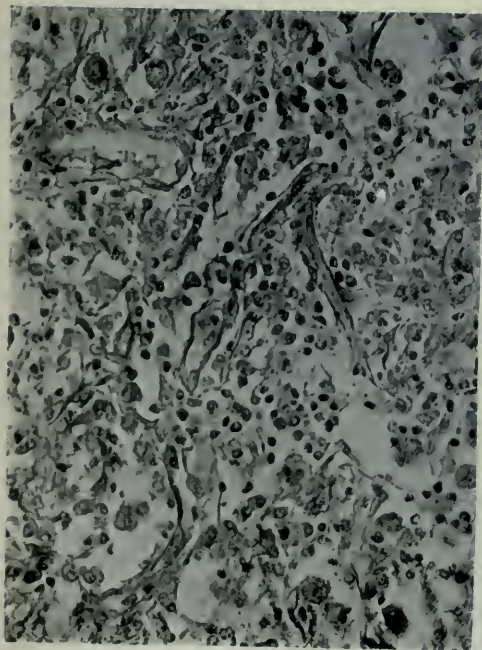
CASE III.—P. B. B. H. Surg. No. 13340. *Presumed suprasellar tumor. Osteoplastic frontal exploration with dis-*

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Fig. 17. Case III. Median sagittal section of the brain showing internal hydrocephalus and the cystic tumor which occupies the chiasm and pushes up behind the third ventricle compressing the foramina of Munro.



Figs. 18 and 19. Case III. The section of the chiasmal tumor on the left (x 300) shows typical glial cells and fibrils, and also a number of round cells. The section on the right (x 300), of the optic nerve, shows the abundant fibrillae and no trace of the architecture of the nerve.

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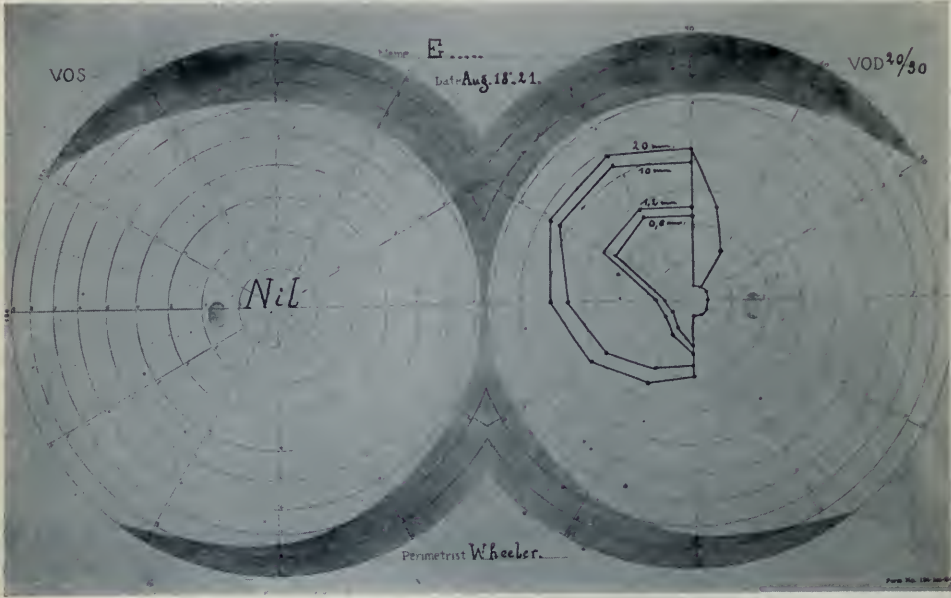


Fig. 20. Case IV. Fields of vision showing a right temporal-field defect short of a complete hemianopsia.



Fig. 21. Case IV. Showing slightly enlarged sella, with overhanging anterior clinoids, and pressure erosion of the dorsum.

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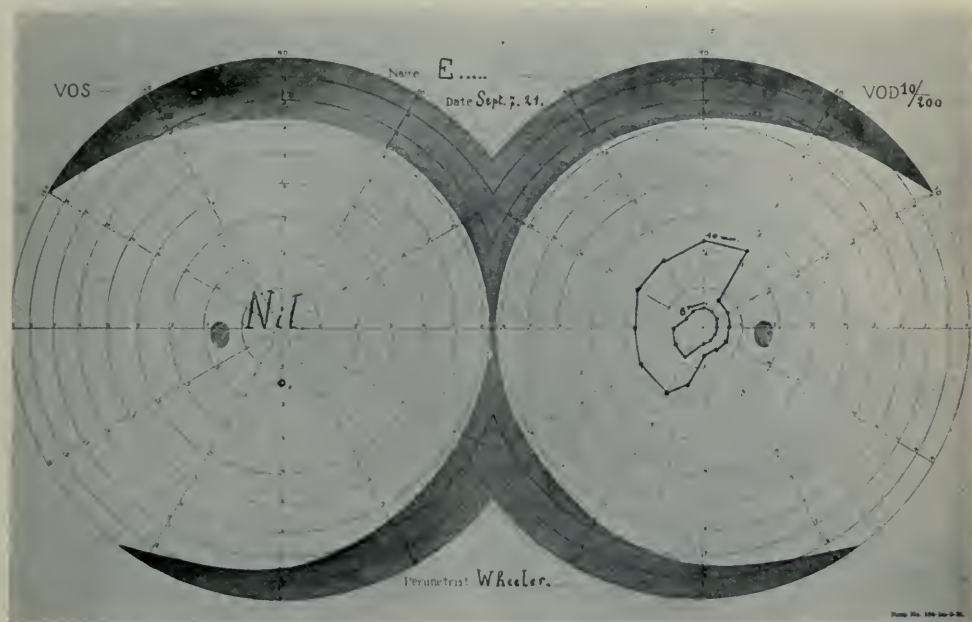


Fig. 23. Case IV. Fields of vision taken before discharge, showing further constriction with lowered visual acuity.

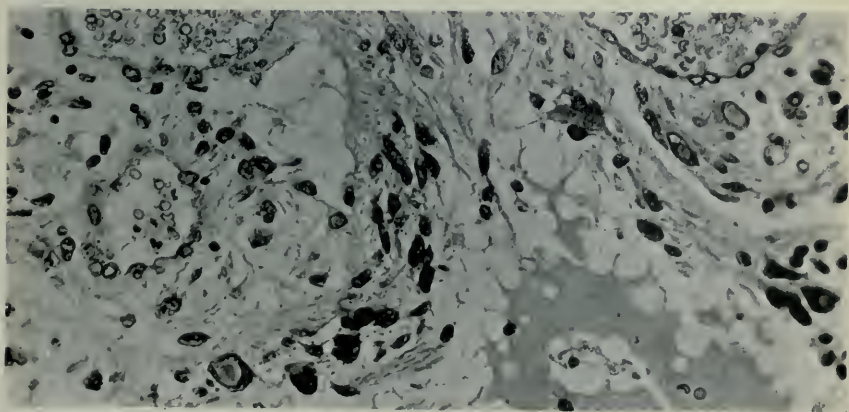


Fig. 24. Case IV. Section of tumor (x 300); probably the type of optic-nerve glioma frequently called "myxosarcoma."

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Fig. 25. Case V. A badly centered X-ray plate showing thinned, elevated, and pointed anterior clinoid processes regarded at the time as uninforming (*cf.* Fig. 31).



Fig. 26. Case V. Base of brain showing the tumor, from which the thickened optic nerves emerge. The stalk of the pituitary body is evident and the carotid arteries are seen to indent the growth on each side. Where the left temporal lobe has been cut away one may see that the optic tract is tumefied for a short distance from the main tumor.

closure of a chiasmal glioma. Postoperative hyperthermia. Autopsy.

October 14, 1920.—Admission of William H. E., age 14, referred by Dr. G. S. Row of Indianapolis, Indiana, with the complaint of loss of vision, frontal headaches, and obesity. Family and past history without bearing on the condition.

Chronology of Symptoms.—In November of 1919 the boy, who had previously been thin, began rapidly to put on weight. In July of 1920 there was an onset of blurred vision, which progressed. Drowsiness and frontal headaches followed.

Positive Neurological Findings.—Obesity. Absence of pubic and axillary hair (not however regarded as a typical example of adiposogenital dystrophy). Primary optic atrophy with blindness on the left and marked loss of vision on the right. The perimeter showed an extensive defect of temporal field on the right regarded as an imperfect temporal hemianopsia (Fig. 14). Slight external strabismus on the right. Pupils: left immobile; right reacts very sluggishly to light. X-ray of the skull reported as showing a slight convolutional atrophy of the vault with widening of the sella, but in both respects this report was discredited in the ward. (Fig 15.)

October 21, 1920.—Operation (Cushing) for presumed suprasellar tumor of craniopharyngeal-pouch origin. Osteoplastic frontal resection. Region of chiasm brought into view without difficulty, disclosing the involvement of the right optic nerve and chiasm (*cf.* operative sketch, Fig. 16) in a reddish tumefaction. The left nerve appeared to be fairly normal in size. The condition was regarded as inoperable and the wound was closed. There was an immediate postoperative hyperthermia, the temperature reaching 107° F. within a few hours. The patient never regained consciousness and died in thirty-six hours.

Autopsy.—The brain, removed after fixation, reveals no operative or postoperative complication; no evidence of contusion, clot or infection. There is a moderate internal hydrocephalus. The right optic nerve is enlarged by a tumor mass which extends upward behind the third ventricle (Fig. 17).

Histological Note.—(1) Sections of the tumor (Fig. 18) taken in various places show it to be composed chiefly of spindle and spider cells with long glia fibrillæ which, together with much collagen from the blood vessels, make up the oedematous stroma. Cells of large type with pale and abundant cytoplasm and small sharply staining round nuclei abound in all parts of the tumor. Mitotic figures are

numerous. The sections across the right optic nerve show the nerve to be more seriously involved than in Case II, for here there remains no trace of the architecture of the nerve and long fibrils are particularly numerous (Fig 19).

(2) A longitudinal section though the pituitary gland shows an unusual number of glial cells and fibers in the stalk which the growth has apparently begun to infiltrate.

(3) Cross sections taken through the optic tract show a great number of neuroglial fibrils from what appears to be a secondary gliosis but no actual tumor.

Comment.—In this case, as in the preceding one, an operation was performed with the expectation of finding a pharyngeal-pouch tumor. The operation was conducted without particular incident and the wound closed as soon as the nature of the lesion was recognized. Nevertheless, hyperthermia occurred and all efforts symptomatically to combat the high temperature were unavailing. This matter will be subsequently referred to.

A re-examination of the X-ray plates shows that although neither of the pair gives an exact lateral view, in the stereoscope they show an apparent anterior extension underneath the clinoid processes, representing, as we now incline to believe, the dilated optic foramina (Fig. 15 O. F.).

CASE IV.—P. B. B. H. Surg. No. 15043. *Provisional diagnosis of suprasellar tumor. Transfrontal exploration disclosing a glioma of the chiasm. Operative recovery.*

August 16, 1921.—Admission of Frederick C. E., age eight, referred by Dr. W. E. Monroe of Rochester, New York, with complaint of loss of vision. Family and past history essentially negative.

Chronology of Symptoms.—In the summer of 1919 with no premonitory symptom it was observed that the boy could not see with his left eye and when examined it was found that vision in the outer field of his right eye was also impaired. In April, 1921, onset of frontal headaches and vomiting.

Positive Neurological Findings.—Nothing beyond a bilateral primary atrophy, with a low grade of what was taken to be a super-imposed papillœdema on the right; also complete blindness on the left and a temporal hemianopsia on the right (Fig. 20). The cranial X-ray showed some convolational atrophy with slight separation of cranial sutures; the sella was enlarged (Fig. 21) in its antero-posterior diameter with marked erosion of the erect dorsum.

Provisional Diagnosis.—Pharyngeal-pouch tumor with hydrocephalus.

August 22, 1921. Operation (Cushing).—Osteoplastic right transfrontal procedure. Puncture of ventricle; fluid under considerable tension, but apparently not in great excess. Right optic nerve found to be discolored, enlarged, and to emerge in conical shape from a tumor which made it impossible to see or identify the left nerve. A small fragment of tissue was removed for diagnosis.

Postoperative Notes.—The patient made a good recovery (Fig. 22). He was discharged on September 18th, at which time the fields of vision had become still further constricted (Fig. 23).

Pathological Note.—The fragment of tissue removed shows on section a somewhat vascular tumor with a relatively large amount of intercellular substance. The cells are round to oval and are scattered among interweaving delicate intercellular tissue strands which take the neuroglia stain. An occasional mitotic figure is present. It shows in areas the perivascular cellular reaction common in gliomas in general. The tumor is of the type often erroneously designated as myxosarcoma (Fig. 24). *Diagnosis:* glioma.

Subsequent Reports.—Letter from mother *November 6, 1921*, reports that patient had been having a period of drowsiness but had recovered. On *January 29, 1922*, she reported patient happy, playing outdoors most of the day, and still with sufficient vision to get about alone. A later report, *June 13, 1922*, vision almost gone; beginning to show exophthalmos of right eye; slight elevation of bone flap; otherwise in very good general condition. Death *August 30, 1922*, one year after operation.

Comment.—Before this unfortunate little boy's end the process had apparently extended to the intraorbital portions of the nerves with the production of exophthalmos. Without autopsy the diagnosis of a primary chiasmal lesion cannot be absolutely assured. The optic nerve on the side chiefly involved, the left, was not seen at the time of operation. The microscopic picture of the tumor, moreover, is very unlike that of the other cases in the series, being more of the "myxosarcomatous" type described by others. It is possible that it might have taken its origin in the hypophysial stalk or posterior lobe and have invaded the chiasm secondarily, but one would hardly have expected so great destruction of the chiasm had this been the case. Nor do these lesions tend to

invade the orbit and produce exophthalmos. The only indication of involvement of the hypophysis was a low metabolic rate (-22); otherwise there were no signs of dyspituitarism.

CASE V.—P. B. B. H. Surg. No. 16111. *Presumptive brain abscess. Subtemporal exploration. Death with hyperthermia. Autopsy: glioma of optic chiasm.*

February 18, 1922.—Admission of James P., age 56, referred by Dr. W. J. Daly of Boston, complaining of frontal headaches and loss of vision.

Chronology of Symptoms.—Onset ascribed to an injury with laceration of the scalp received five months before admission. The wound was sutured, became infected, was reopened and suppurated for some days. Soon after this the patient began to complain of soreness and right-sided headache. Two weeks later his vision began to fail, more rapidly on the right than left. For three months there has been complete bilateral blindness. Two or three attacks of projectile vomiting have occurred. He has been untidy, unruly, and disoriented for the past three weeks.

Positive Neurological Findings.—Marked stupor. Choked disk (?) of 2 to 3 D. with extreme atrophy (regarded as secondary). No exophthalmos. X-ray examination (unsatisfactory because of poor coöperation) shows no evidence of intracranial tension. Sella (Fig. 25) imperfectly shown but regarded at the time as uninforming. Temperature on admission 102° . Leucocytes 22,000. Subsequent slight daily elevation of temperature.

A tentative diagnosis of cerebral abscess was made with no definite localization.

February 28, 1922. *Operation* (Martin).—An exploratory subtemporal decompression disclosed a wet brain without apparent increase of tension. Two exploratory punctures failed to disclose an abscess or to reach the ventricle.

Postoperative Note.—Following the operation the patient became progressively more stuporous and died the second morning in hyperthermia.

Pathological Note.—Brain removed within its meninges after preliminary fixation. At the base, lying between the cerebral peduncles, there is a nodular tumor about 3 cm. in diameter, occupying the site of the optic chiasm (Fig. 26). The tumefied optic nerves can be seen to emerge from each side of the anterior portion of the growth. Pursued into the orbit they were found to be thickened even as far as the globe.

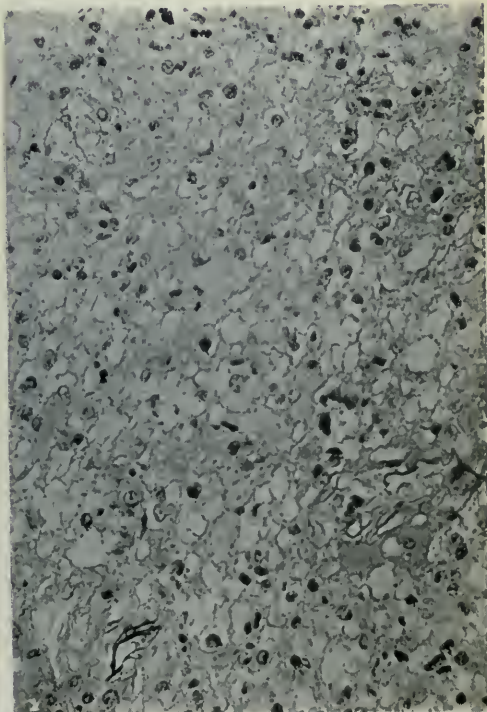
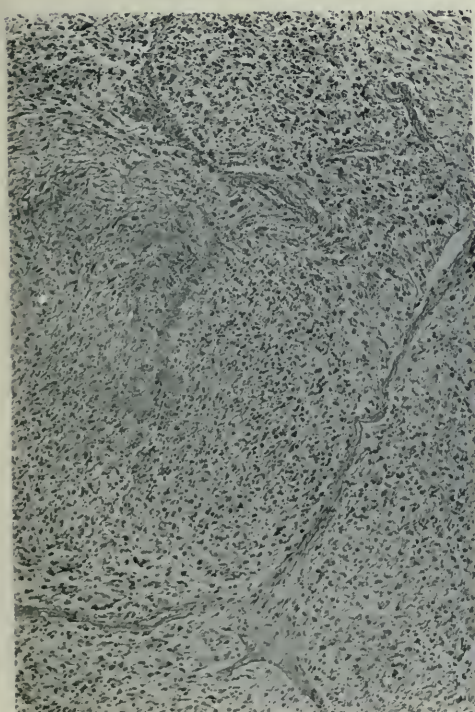
The optic tract on one side, exposed by cutting away the temporal lobe, proves to be invaded by tumor for a short distance from the tumefied chiasm (*cf.* Fig. 26) behind

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Fig. 27. Case V. Longitudinal section of the brain showing the tumor extending upward into the space occupied by the third ventricle.



Figs. 28 and 29. Case V. Section on the left under low power (x 80) through the optic nerve near its orbital junction, showing typical gliomatous structure between the normal connective tissue bands. On the right a higher magnification (x 300) showing a few fibrils and cytoïd bodies.

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Fig. 30. Case V. Longitudinal section through optic nerve and disk showing the extension of the tumor even to the papilla explaining the measured swelling of 2-3 D. observed clinically but misinterpreted.

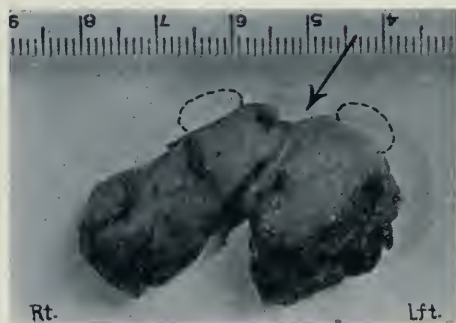


Fig. 33. Case VI. Tumor removed at operation (nat. size) seen from below. Dotted ovals show approximate position of optic foramina. Arrow points to median cleft.

which in the midline the apex of the infundibulum is readily identified. A sagittal section (Fig. 27) shows the tumor occupying the site of the third ventricle. No apparent hydrocephalus.

Histological Note.—Blocks taken from the main tumor mass as well as from the optic nerves and tract show the growth to be somewhat vascular with abundant collagen fibrils about the vessels. A section of the nerve stump near the optic foramen shows traces of the original architecture of fibrous tissue between which is a massive glioma and no recognizable nerve fibres (Fig. 28). There are comparatively few well-stained neuroglial fibrils (Fig. 29). Mitoses not infrequent. The tumor in places shows a few small cysts. Sections through the optic nerves (Fig. 30) show them to be involved in the process as far as the optic papilla.
Diagnosis: glioma of chiasm.

Comment.—We were misled in this case by the undue emphasis laid on the story of a recent infection of the scalp, which, supplemented by his fever and leucocytosis, led to a presumptive diagnosis of abscess. Moreover his mental condition was such as to preclude many of the usual details of examination. We should have been made suspicious by the complete blindness, which would hardly have been expected with abscess, and also by the atrophic pallor of the obviously swollen disks which, however, showed no new tissue formation. There was a measurable swelling which we recognized as somewhat peculiar in its appearance, but beyond this we could not go. As the examination now shows, the swelling was due to an extension of the growth the full length of each of the nerves. It is quite possible that more expert ophthalmologists than ourselves might have recognized that the projection of the disks was due to tumor rather than to a papilloedema superimposed on an atrophy.

It is to be especially noted that neither adiposity nor polyuria were present. However, there was marked somnolence disproportionate to his general pressure symptoms and which in view of the findings must be considered as possibly a neighborhood symptom. It is conceivable that the fever in some way represented a thermo-regulatory disturbance, but this does not account for the leucocytosis. The patient hardly regained consciousness after the decompression and died forty-eight hours later in hyperthermia.

Unfortunately the process had become too far advanced for perimetry, and it is also unfortunate that it was impossible, owing to his condition, to get a good X-ray negative. For if there is anything in our impression that these tumors give a characteristic anterior elongation of the sellar profile, this case should have shown it as well as any of the others. A proper interpretation of the plate with its oblique view of the sella (Fig. 25) and its long, overhanging, thin anterior clinoid processes, becomes possible by comparison with the sella of the following case (*cf.* Fig. 32).

CASE VI.—P. B. B. H. Surg. No. 16342. *Presumed suprasellar tumor from cranio-pharyngeal pouch. Neurofibromatosis (?) Right osteoplastic frontal bone flap: partial enucleation of tumor: postoperative fatality. Autopsy: glioma of the optic chiasm.*

March 28, 1922.—Admission of Mary E. D., aged six, referred by Dr. Charles G. Beall of Fort Wayne, Indiana, with the complaint of failing vision and drowsiness.

Family and past history unimportant except that the mother presents a mild hyperthyroidism, and in addition to the usual diseases of childhood the patient has had a lisp for which two minor lingual operations were performed early in life.

Chronology of Symptoms.—Eight months ago onset with failing vision. The child became a little apathetic, and the mother noticed that she was gaining in weight a little faster than previously. For the past four months there has been headache with vomiting. There has also been some change in disposition and she has become "cranky."

Positive Neurological Findings.—Primary optic atrophy. Near blindness. Pupils react sluggishly to light. Narrowing of fields of vision to rough test but coöperation not sufficiently good for reliable perimetry. Slight adiposity (Fig. 31). Slight enlargement of the thyroid. Marked irritability. Some small pigmented patches under the left nipple and left side, but no other signs suggesting generalized neurofibromatosis.

The cranial X-ray shows an increase in the depth of the meningeal channels and some convolutional atrophy. The sella (Fig. 31) shows a marked hour-glass deformation with extension forward under the unusually long and pointed anterior clinoid processes.

Preoperative Diagnosis.—Probably pharyngeal pouch (suprasellar) tumor.

April 7, 1922. *Operation (Cushing).*—After elevation of

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Fig. 31. Case VI. Photograph of patient on admission, *cf.* pigmented patches on left trunk below nipple.

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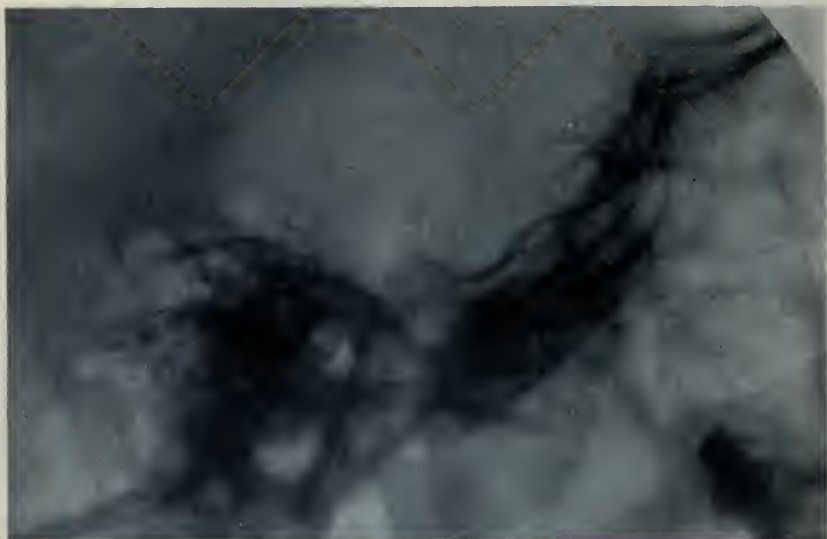


Fig. 32. Case VI. X-ray showing the apparent anterior extension of the sella under the thinned and elevated anterior clinoids from distension of optic foramina.

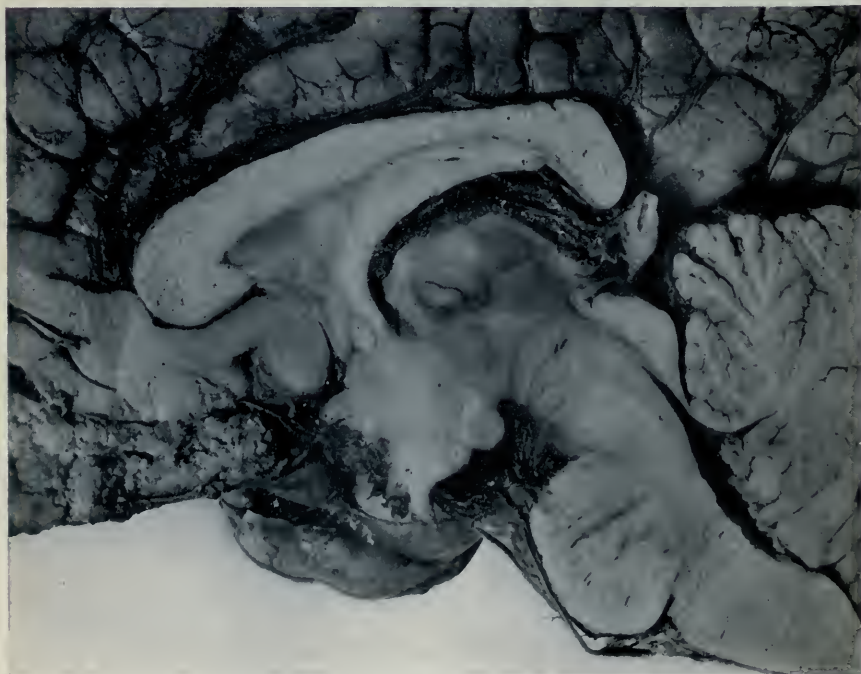
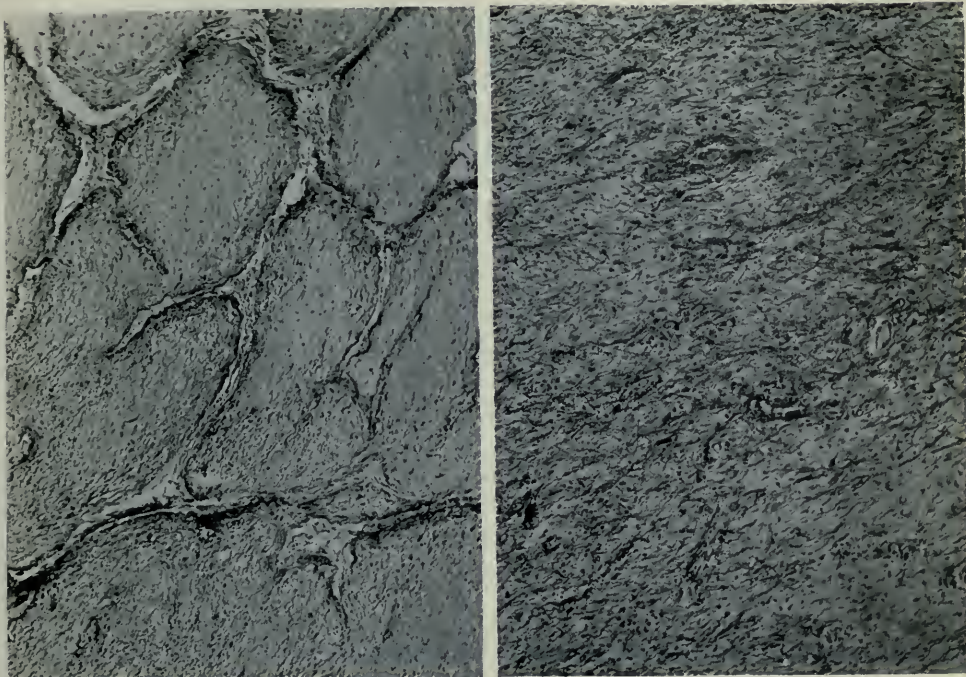


Fig. 34. Case VI. Mid-longitudinal section of the brain showing the remaining stump of the tumor which has displaced the third ventricle backwards.

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Figs. 35 and 36. Case VI. On the left a low-power section of the tumor (x 80) taken through the nerve and showing traces of its architecture. On the right a higher magnification (x 300) showing very abundant glia fibrils and a few cytotoid bodies.



Fig. 37. Case VII. X-ray of sella, unfortunately not in a direct perpendicular plane, nevertheless shows apparent extension of sellar fossa under anterior clinoids due (?) to dilated optic foramina.

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Fig. 38. Case VII. Sketch of appearances seen at operation, precisely like those of Case VI in which tumor removal was attempted.



Fig. 39. Case VII. Patient showing scar of usual incision ten days after transfrontal operation for suprasellar exposure.

the frontal lobe and exposure of the chiasmal region a roundish tumor, of firm consistency suggesting an endothelioma, was disclosed lying in about the position of the right optic nerve. On investigating further another similar mass to the left was brought into view. There was no suspicion at the time that the tumor was chiasmal in origin. An effort was made to identify the nerves and on the right side was seen what was taken to be a dislocated grayish nerve, though it proved to be the carotid pushed downward by the growth. The two legs of the tumor were bluntly dissected out from under the ridge between the clinoid processes and the growth, which was firm, was gradually and easily dislodged and gently drawn forward. This manipulation, however, caused a sudden cessation of respiration which lasted about one-half hour and required artificial respiration. After spontaneous breathing had been resumed, the tumor (Fig. 33) was dislodged in what seemed its entirety, the procedure being practically a bloodless one. It was most disconcerting after the removal of the growth not to be able to identify the optic nerves, which were thought to have been overlain by it. Not until this disclosure was the suspicion aroused that a primary tumor of the chiasm had been removed—a tumor which had involved and completely obliterated the nerves.

Postoperative Note.—The patient did badly after the operation; at its close her temperature was 104°. Respirations were regular all through the night, but early in the morning they became shallow and she expired without having regained consciousness. Temperature 106°.

Pathological Note.—Brain removed after carotid injection with fixation in situ. The intraorbital portions of the nerves unfortunately were not removed. The base of the brain shows a clean operative defect, free from blood clot, resulting from the removal at operation of optic nerves, optic chiasm, and all but a stump of the left optic tract. A sagittal section (Fig. 34) shows the remaining stump of a tumor which extends upward to the third ventricle but is not large enough to cause an internal hydrocephalus by blocking the foramina of Munro. The brain is otherwise normal.

Specimens for microscopic study were taken from the chiasmal tumor itself, from the floor of the third ventricle and also from the optic nerve and tract. Sections from the first two sources are similar and represent true tumor formation, a solid mass of neuroglia fibrils, and small round and oval cells which are unquestionably glial (Figs. 34 and 35). No mitoses are seen. In some of the sections from the floor of the third ventricle one finds basic staining

amorphous material in masses and strands which, no doubt, represents the so-called cytoid bodies found in these tumors. Sections of the hypophysis show a rather large but histologically normal gland.

Comment.—Our sorry experience with this particular case was what led us to make this review of the subject with its unexpected disclosure that the preceding five cases represented a lesion of comparable type and from the same source. The preoperative diagnosis, based on the primary optic atrophy, the suggestive adiposity and the slightly deformed sella, as in three of the foregoing cases, was again in favor of the more common lesion of this region, namely a suprasellar cyst of cranio-pharyngeal pouch origin. At the operation the optic nerves were found to be so completely involved in the process that they were not recognized and there was thought to be an enucleable tumor overlying the nerves and chiasm. Accordingly in removing the growth both optic nerves and the entire chiasm were dissected out and the posterior extension of the tumor, which proved to be a tumefied tract, was withdrawn. It was a sad error not likely to occur again, for the appearance is an unmistakable one when once appreciated. The operation resulted in a fatality in hyperthermia.

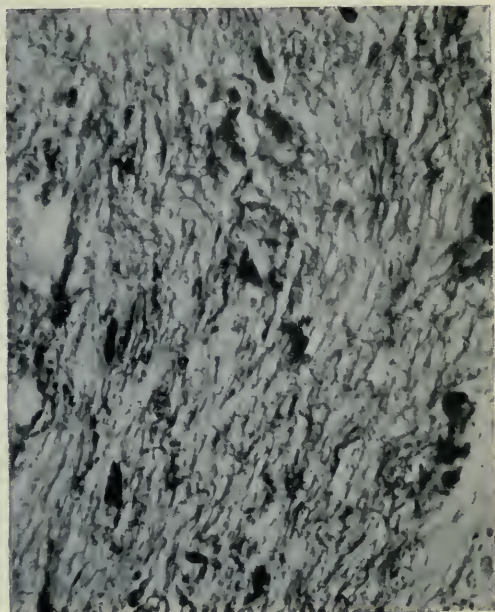
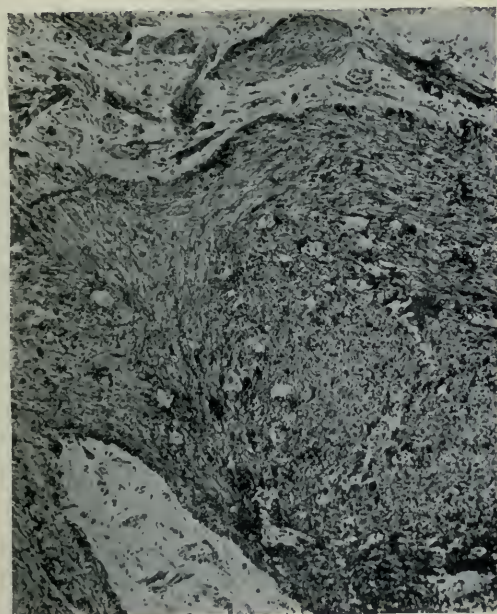
It is unfortunate that the intraorbital portions of the nerves were not removed at autopsy. They were almost certainly involved in the process for the optic foramina were obviously much enlarged.

One thing more deserves comment, namely the patches of brownish pigmentation shown in this child's skin (*cf.* Fig. 31), which may possibly be interpreted as a tell-tale of von Recklinghausen's disease. Moreover, the tumor had a different histological architecture from all the preceding ones, with the exception possibly of the first. In both these respects the case appears to be more closely allied to the following and last one in the series, in which for the first time a presumptive diagnosis of chiasmal tumor was made before operation.

CASE VII.—P. B. B. H. Surg. No. 12320. *Generalized neurofibromatosis with progressive blindness. Transfrontal operation with verification of inoperable glioma of nerves and chiasm.*
October 24, 1922.—Admission of Rachel S., age 20, referred

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Figs. 40 and 41. Case VII. Sections of fragment removed for histological verification. Showing masses of neuroglia fibrillae (x 80 left; x 300 right).

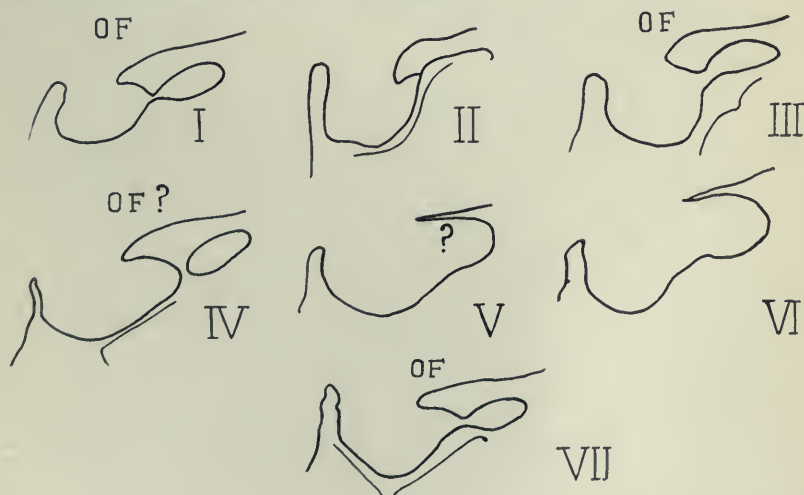


Fig. 42. Profile drawings of the sella in the seven cases as interpreted by stereoscopic views. In Case I, though advanced, the optic nerves were not greatly enlarged beyond the foramen. In Case II the process was an early one. In Case III one nerve was greatly enlarged at the foramen. In Case IV the process was advanced, in Cases V and VI still more so.

by Dr. B. S. Chaffee of Long Beach, California, with the complaint of failing vision and intracranial discomforts.

Clinical History.—Her parents and their five other children are healthy and well. She had the usual infectious diseases of infancy in mild form. She has always had defective vision and was born with a squint for which an operation was performed in her sixth year. At seven a tumor of some sort was removed from her nose. She had a precocious adolescence and her menstruation was established at nine but has always been scanty and most irregular. She averages about four periods each twelve months. At eleven a neuroma of the median nerve was removed from her right arm, and at the time her parents were told that she had a brain tumor also. Always addicted to colds, her tonsils were removed two months before admission.

She has always been somewhat obese and short in stature, but others in the family tend in this direction. She is intellectually alert and mature for her age.

Throughout her life chief concern has been felt for her defective eyesight, which has been slowly and progressively failing. For this she has seen many physicians. When examined by Dr. Lloyd Mills in March, 1922, there was practical blindness on the left and on the right vision was reduced to $\frac{3}{80}$. A small field of central vision was all that remained. The X-ray showed a deformed sella, and under the supposition that she had a pituitary cyst she was given glandular feeding without avail. Three months later her vision had dropped to $\frac{1}{80}$ and there was so great complaint of increasing retro-orbital discomforts that an operation of some sort was thought necessary if only to establish a diagnosis.

Physical Examination.—A bright, intelligent, and co-operative, somewhat adipose girl weighing 56.7 kilos; height 143.7 cm. There are numerous pigmented moles, mollusca fibrosa, and patches of brownish pigmentation over the trunk, chiefly on thorax and back. Near the right popliteal space is a large plexiform neuroma. Her skin, moreover, has the peculiar odour characteristic of von Recklinghausen's disease.

Aside from these cutaneous lesions typical of neurofibromatosis and the condition of her eyes, the neurological examination was essentially negative. The pupils were considerably dilated with sluggish reaction to light. The fundi showed pale atrophic nerves with no vascular stasis or elevation. Vision on the left was reduced to faint light-perception. On the right it was estimated at $\frac{3}{80}$. Perimetry was impossible though the patient thought that the perception of test objects was confined to the nasal retina.

The X-ray (Fig. 37) shows stereoscopically an apparent anterior extension of the sella due to dilatation of the optic foramina, with prominent anterior clinoids but with no pressure erosion and no suprasellar shadows.

Her hypophysial or polyglandular symptomatology aside from the adiposity and the history of early puberty is negative. No polyuria, somnolence, etc. The basal metabolism was estimated at -13.

Preoperative Diagnosis.—Generalized neurofibromatosis with cranial-nerve involvement; presumable neurinoma of chiasm.

November 3, 1922. Operation. (Cushing).—A right trans-frontal osteoplastic resection. An exceptionally good view of the chiasm was secured. It revealed a symmetrical tumefaction involving chiasm and nerves up to the optic foramina (Fig. 38). A wedge-shaped piece of tissue was removed from the left (the blind side) for verification. The tumor was firm and relatively non-vascular. It was evidently not the usual neurinoma-type of tumor. The bone-flap was replaced and closed without further measures.

Postoperative.—She made a proper recovery from the operation. Her symptoms remained unaltered. Radiotherapy as a chance source of relief was inaugurated and she was discharged November 17th (*cf.*, Fig. 39). A few days later she returned to present herself at the clinical demonstration mentioned in the introductory foot-note.

Pathological Note.—Serial sections were taken from the small block of tissue. Various stained they show an outer fibroma capsule underlain by dense neuroglia tissue (Figs. 40-41). There are a few strata of connective tissue, possibly the remains of optic-nerve structures. The neuroglia consists largely of masses of fibrils. There are no mitotic figures of undifferentiated cells. There are cytooid bodies as well as globular and rod-like masses of hyalin such as Verhoeff has described in his cases of glioma.

Comment.—There could be little doubt of the structure involved by the tumor in this case before the operation. However, in view of our unfamiliarity with these cranial nerve tumors apart from those involving the acusticus, there was sufficient uncertainty, as to the exact type of lesion which would be found, to justify the exploration which was strongly urged. The chief uncertainty was occasioned by the knowledge that in cases of generalized neurofibromatosis, as is known, there may be multiple meningiomas (dural endothelio-

mas)¹ as well, and there was a possibility, in view of the chronicity of the process, that one of these tumors arising from the suprasellar diaphragm and involving the chiasm might be encountered.

A lesion of the neurinoma type was anticipated and it was hoped that a soft encapsulated tumor would be found which could be partially enucleated with some chance at preservation of the remaining nerve fibers or even of some restoration of vision; for in some of the acoustic tumors thus treated, hearing may subsequently be improved.

Even when the tumor was exposed and found to have originated in the chiasm and the section from the blind nerve was removed for histological verification, we had little doubt but that it would prove to be a neurinoma though it was more firm than the usual run of these tumors and showed no evidence of the fatty degeneration they are prone to undergo. All of this indicates how much we have to learn regarding these lesions.

The tumor closely resembles that of the preceding case and of Case I, and is gliomatous beyond question.

GENERAL CONSIDERATIONS

These clinical records have been presented in abstract largely as they occur in the formal case histories. It has been difficult, however, not to write into them some of the observations and opinions which have been the result of our subsequent study of the group of cases as a whole. It was not until the calamitous undertaking in Case VI that the condition was revealed to us in its true light and we were enabled not only to interpret the earlier cases but to make a proper diagnosis in the last of the patients. Our views, consequently, as they now stand are not those held at the time the patients were under observation: for example the discovery of the extension of the tumor to the nerve head in Case V has only been a recent finding. Moreover, our present interpretation of the X-ray deformations, which except for Case VI caused

¹ This matter has been fully discussed in the monograph by one of us on the *Tumors of the Nervus Acusticus*, 1917, W. B. Saunders Co., Phila., Chap. VIII, p. 210.

little comment at the time the plates were taken, are new and possibly may have to undergo some alterations as further experience may dictate.

Little in the way of discussion or summary, needs to be added to the separate comment upon each of the six clinical histories which have been given. It may be noted that in four cases the symptoms originated in the first decade, the youngest patient at operation having been four years of age. One of the patients, however (Case V) was in his sixth decade.

The region occupied by the growth was recognized before operation in five instances, though in only the last of them was its possible primary source of origin in the nerves or chiasm taken into consideration before the lesion was exposed at operation. Even when so exposed, in one instance (Case VI) because of the extensive involvement which had completely obliterated the chiasmal landmarks, the actual condition was not recognized till an attempted enucleation revealed its true source.

In two of the seven cases (Nos. I and V) the lesion was not even localized during life, owing partly to poor coöperation and partly in each instance to an imperfect and misleading history. Notwithstanding this, a tumor in the suprasellar region under ordinary circumstances is not at all difficult to localize, and in the presence of a fairly normal rather than a greatly enlarged sella the preponderance of the congenital tumors originating from Rathke's pouch over tumors of all other types leads in the long run to a preferential diagnosis of such a lesion. Nevertheless, in the radiographic absence of shadows produced by the calcareous deposits common in these lesions, one may well hesitate in arriving at such a diagnosis in view of these seven experiences.

Diagnosis.—It would be highly desirable if these lesions could be distinguished from the far more common tumors of the interpeduncular region which involve the optic chiasm secondarily. It is evident from what has been said, that, except in the presence of obvious evidences of von Recklinghausen's disease, we must depend in a differential diagnosis largely upon three sources of information: the ophthalmoscope, the perimeter and the X-ray.

All seven cases showed an advanced optic atrophy, and in five there was no doubt of it being primary, as would be ex-

pected from a lesion of any sort whatsoever compressing the nerves or chiasm; and, so far as we can see, the ophthalmoscopic picture of these conditions is indistinguishable. In Case V, however, the nerve showed in addition to the atrophy a measurable protrusion which was mistaken for a choked disk until the post-mortem examination revealed an extension of the tumor through the entire intraorbital course of the nerve. In two other cases (I and IV) the atrophic nerve was thought to show a superimposed oedema which was attributed to a presumed internal hydrocephalus. This is a matter sometimes most difficult to determine, as one of us has pointed out on several occasions,¹ and in these two cases as in Case V the appearance mistaken for a papilloedema may have been due to tumor. From an ophthalmoscopic standpoint, therefore, we have not much to go on unless the tumor happens to have extended to the nerve head where, by an ophthalmologist, more expert than ourselves, it might be recognized as Verhoeff thus recognized the lesion in one of his cases.

The loss of vision in all instances, with the exception of the last, has been comparatively rapid and progressive, so that by the time the patients came under observation it had advanced to blindness in one eye at least. One patient was totally blind on admission, and two of the young children, in whom the registration of visual acuity was not possible, had apparently but little vision remaining. In the three patients whose acuity was recorded, vision was lost in one eye and greatly impaired in the other. Unilateral blindness is not uncommon as the result of pressure from pituitary tumors, but central vision of the other eye may long remain normal or be only slightly altered. The fact that vision is so markedly diminished in the less affected eye seems to be a characteristic of the chiasmal tumors.

Perimetric observations which were regarded as reliable were possible in only three of the patients. All showed a defect in the temporal half of the field, but in no instance did the hemianopsia show the clean vertical bisection which so often characterizes a pituitary tumor.

Stereoscopic plates of the skull were taken in all but one

¹ Cushing. "Les syndromes hypophysaires au point de vue chirurgical." *Rev. Neurol.*, 1922, xxix., 779-808.

(viz. Case V) of the seven patients. In only one of them (Case II in which the process was not advanced) does the sella as now reviewed appear to us to be within normal limits, though at the time the negatives were first described, those of Case VI were the only ones regarded as sufficiently abnormal to justify special comment. The individual prints accompanying the text show less well than when seen stereoscopically. Few of them happen to have been taken in the perpendicular plane and consequently the accompanying outline sketches have been made for purposes of interpretation (Fig. 42). The peculiar sellar profile of Case VI was what first arrested our attention, and it is now apparent that in Cases I, III, IV, and VII there is a recognizable anterior extension of the fossa which passes like the neck of a gourd under the anterior clinoid processes. This is demarcated from the sella proper by the elevation made by the olivary eminence or tuberculum sellæ. It is more marked in the cases with the fully developed bilateral tumors and appears to be due to a pressure enlargement of the optic foramina.¹ In Case I what is taken to be the outline of the enlarged foramina still retains a faint perceptible shadow of the pillars supporting the anterior clinoid processes which normally gives the radiographic boundary of the sella in profile. In Case III this is lost and in Cases V and VI the absorption has gone on to such an extent, with tilting up of the clinoid processes, as to leave a large space between the clinoids and the tuberculum sellæ when seen in profile. Unfortunately in only one of the fatal cases (Case VI) was a special 'post-mortem note made of the anterior excavation made by the tumor, and which on lateral radiographic view (Fig. 32) was almost as large as the sella proper.

We may be over-emphasizing this factor as of possible diagnostic value though it is one of the points which gave support to the diagnosis before operation in Case VII. It is a

¹ An examination of the human skull will show that the flat pillars of bone to which anatomists seem to have given no name but which lie to the outer side of the optic foramen, separating it from the sphenoidal fissure, and which support the anterior clinoid processes, would in many cases quickly undergo pressure absorption with tumor distension of the foramen itself, thus throwing on lateral view the two cavities (viz. that of the sella itself and that made by a depressed optic groove and enlarged foramina) into one.

matter which will need further anatomical and radiographic study and may not prove to be confirmed.¹

Evidences of secondary hypophysial involvement have been inconspicuous, and such as they were they probably have been over-emphasized in the elaborate case histories which we have here so briefly summarized. There is, however, no reason why these secondary manifestations of a local lesion should not appear, for the hypophysial stalk and tuber cinereum are likely to become implicated in all cases in which the growth extends from its original confines, as it seems inevitable that, in time, it should do. A tendency to adiposity was apparent in four of the patients, a slight degree of polyuria and polydipsia in two of them, somnolence and lassitude, which of course are not of great diagnostic value, in two; and loss or lack of hairs in two cases. In none of the patients, however, were these symptoms in sufficient evidence to justify the designation of adiposo-genital dystrophy which characterizes advanced grades of pituitary insufficiency.

In view of these things, if one should attempt to make a differential diagnosis of a chiasmal glioma from the more common variety of suprasellar tumor arising from Rathke's pouch, taking into consideration the fact that they are both commonly recognized in childhood, he would cling to the following straws:

Tumor of Craniopharyngeal Pouch

Primary optic atrophy. In late stages owing to hydrocephalus oedema may be superimposed.

Bitemporal hemianopsia, or if vision lost in one eye, fairly acute vision retained in the seeing half of the other eye.

Process slow, often remaining stationary for long periods.

Tumor of Chiasm

Primary optic atrophy occasionally with tumor involvement of nerve head. Unilateral exophthalmos in advanced cases.

Acuity low in both eyes with fields showing less typical hemianopic defects.

Process on the whole more rapid and progressive.

¹ So-called pear-shaped sellas unassociated with an optic atrophy are regarded as fairly common, though a review of our negatives makes them appear to be less so than we had supposed. Timme in a recent paper (*Arch. Neurol. and Psychiat.*, 1921, v., 568) reports a similar abnormality in the sella turcica of 23 out of 24 cases of Mongolian idiocy. It evidently has nothing to do with an abnormality of the pituitary body.

Tumor of Craniopharyngeal Pouch.

Sella variously deformed, enlarged or normal. Posterior clinoids more affected than anterior. Suprasellar shadows common.

Secondary pituitary manifestations common with adiposo-genital dystrophy and infantilism.

Tumor of Chiasm.

Sella in advanced cases shows apparent extension under anterior clinoids from distension of optic foramina. No suprasellar shadows.

Secondary pituitary manifestations inconspicuous. Cutaneous indications of Von Recklinghausen's disease to be looked for.

Pathology.—In four of the seven cases a post-mortem examination showed a bilaterally symmetrical tumor chiefly involving the chiasm, but tending to invade the opto-peduncular space. The pituitary gland was not involved in any case though its stalk was necessarily distorted as in Case I, where polydipsia and polyuria were observed. In Case III, with adiposity, absence of pubic and axillary hair, the tumor, partially cystic, was of such a size that it must have involved the region of the tuber cinereum. And there were also some signs of early invasion of the gland itself by the growth.

The question naturally arises as to whether these tumors originated in the chiasm itself or in some other structure (optic nerve, optic tracts, posterior perforated substance, hypophysis). It was the operator's impression in Cases II and III (*e.g.*, Figs. 8 and 16) that the process had begun in the intracranial portion of the optic nerve, but the autopsy in Case III belied this impression, for the chiasm was found to be more involved than supposed. In Case I the tumor hardly appeared to extend far into the optic nerves themselves, though on microscopic study they prove to be extensively involved in the process. The gross appearances, indeed, in all the pathological specimens show the tumor to be fairly symmetrical (*e.g.*, Figs. 26 and 33). Though the tumors tend in time to leave their confines and to spread upward behind and above the chiasm into the interpeduncular region of the brain, the evidences are all in favor of their having originated in the chiasm or adjacent nerves even though, as in Case V, the gliomatous process may be found to extend bilaterally as far forward as the optic disk.

The microscopic picture in the seven cases is unmistakably that of a glioma and a complete description is given with each

case report. As is true of gliomas elsewhere in the brain, there is considerable difference not only in the architecture but in the structure of the several tumors. Verhoeff has divided the tumors in his series into three main groups based on the character of the neuroglia. Such a tumor as is shown in Fig. 24 with its vacuolization and cyst formation is doubtless the type often described without justification as myxomatous. The firm tumors shown in Figs. 5, 35, and 40 consist largely of compact masses of glia fibrils and doubtless represent what Hudson preferred to designate as gliomatosis rather than gliomatous tumor. Many of the tumors show an abundance of irregularly shaped masses, which take the neuroglial stain, and which correspond to the so-called "cytoid bodies" of which Verhoeff gives a detailed description. There is no a priori reason why the gliomas of the optic nerve, which embryologically belongs to the diencephalon, should present special formations, and the cytoid bodies, although differently termed, are not infrequently found in gliomas elsewhere. They are usually considered as masses of neuroglia.

Despite all that has been written about them, our knowledge of the gliomata and the tissues from which they spring is very imperfect. It is probable that the studies of the glia made by Ramón y Cajal and his pupils, of which as yet we know but too little, will throw a new light on these tumors which probably arise from glia cells of different types which we will some day be able to differentiate. The least we can do at present is to designate as glioma those tumors of the central nervous system which show glia fibrils with proper selective stains.

Treatment.—Unquestionably if we may come in time to perfect our clinical diagnosis of these lesions there is every reason to avoid operating upon them, though in cases of doubt an exploration may have to be made. One might suppose from the unhappy outcome of three of the operations in this series, that these explorations are associated with unusual risk of a fatality from hyperthermia. Although there is an hypothetical center in the tuber cinereum which presumably is heat regulatory in its function, we incline to the belief that the fatalities in this series were coincidental, because of the fact that much more serious operations conducted in this region

for the removal of pharyngeal pouch tumors, and which unquestionably traumatize the floor of the third ventricle, are attended with a very low mortality. In one of the fatal cases, moreover, no attempt was made to remove the lesion and in another the fatality followed a subtemporal decompression, which could hardly have produced such a dislocation of the tumor as to disturb the thermo-regulatory center.

Whether one would be justified in making a complete removal of the chiasm involved in one of these lesions, should it chance to be exposed at an early stage of the process and before the growth had spread (as in Case II) is doubtful. We venture to express this feeling in spite of the favorable prognosis given by ophthalmic surgeons in cases in which a large glioma has been removed with the orbital portion of the nerve. Treatment by radium or the X-ray, though far from encouraging, in our present stage of understanding of the therapeutic possibilities of deep radiation, is probably our best hope, but final judgment on these matters must be deferred.

Conclusions.—One consideration certainly will be of interest to ophthalmologists, namely that we have here another explanation for some of the obscure cases of primary optic atrophy so often attributed to a retrobulbar neuritis. They will promptly recognize that we have dealt in this paper with a lesion already familiar to them, though largely when the process of tumefaction within one orbit has reached such a size that exophthalmos results.

It is quite possible that we will all, ophthalmologists, neurologists, and neuro-surgeons, come to recognize these lesions with sufficient accuracy to permit us either to avoid operation altogether, or at least to know better with what sort of a lesion we will have to deal before its surgical exposure.

Certainly a primary atrophy in cases of generalized neuro-fibromatosis, or even those with slight manifestations of this malady will rest under suspicion of having a gliomatous process in the chiasm or its adjacent nerves. Suspicion will also be aroused when there is an obvious swelling of an atrophic nerve-head without evidence of increased intracranial tension.

But even in the absence of these tell-tales of the process when a primary atrophy of the nerves in young people is

associated with the peculiar sellar deformation which has been described, and without the shadows usually cast by the more common tumors of this region in childhood, one may well consider the possibility that the symptoms are due to a primary glioma of the chiasm.

FUNDAMENTAL CONSIDERATIONS IN THE CORRECTION OF SQUINT.

BY DR. ARTHUR WHITMIRE, NEW ORLEANS.

(With three illustrations on Text-Plate XXVII.)

THE entire eradication of the trouble transforms the child. The relief from discomfort and his improvement in appearance are a liberation from criticism and conspicuousness, for in seeking to treat such a case, cosmetics is a factor to be considered of first importance.

The facial expression is changed at once. The child becomes confident and happy. The relief that comes from discarding glasses enables him to engage in out-door sports, his general health is improved, and the once miserable little fellow has an equal chance with others. The shrinking, bashful misfit and weakling, headed for failure, is given a right about toward a square deal in life.

For the sake of clear presentation of the means by which squint is corrected we shall briefly review the nature and cause of the defect, offering nothing new in the description.

Squint is a deviation of the eyes, either one or both, from the proper position. It results in double vision which is more pronounced in the beginning of the affection than it is later. Double vision even disappears in most instances for the simple reason that the child learns to disregard the image in the squinting eye. The vision of the deviating eye (unless it be of the alternating character) is gradually lessened in acuity. An amblyopia exanopsia takes place. This condition is nearly always occasioned by the hyperopia of children remaining uncorrected.

An effort to accommodate provokes convergence in propor-

ILLUSTRATING DR. A. WHITMIRE'S ARTICLE ON "FUNDAMENTAL CONSIDERATIONS
IN THE CORRECTION OF SQUINT."



FIG. 1.



FIG. 2.



FIG. 3.

tion to the impulse. Uncorrected errors beginning in children, usually between the second and fifth year, often result in a permanent deviation of the eye. And yet, it is a condition quite easily corrected by prescribing glasses in a vast majority of the cases. The remaining percentage may be corrected by resection and tenotomy, if they present for treatment before the visual acuity has degenerated below the ability to count fingers at short distances.

Fuchs (1) mentions the non-accommodative variety of convergent insufficiency which develops with reference to refractive error. Cases developing before the first year are usually due to congenital malformation, and these should be classified as paralytic squint.

Accommodation squint develops from a periodic one, noticed only when looking at objects near at hand. Later the squint is present when looking at distant objects and finally it becomes continuous.

Occasionally a squint will disappear when the child reaches puberty, but it is a great mistake to count on the defect being *outgrown*. While waiting for it to be corrected by Nature, the sight suffers from lack of development and this loss cannot be recovered. Squint which corrects itself is *pseudo-squint*.

Divergent strabismus may be almost outgrown but returns as one grows older. Slight degrees of deviation are usually more distressing to the patient than those more pronounced, because the image of the squinting eye is quite distinct and cannot be ignored. In squint resulting from wide deviation, the image is so blurred and so far removed from the image of the normal eye that it is hardly in the patient's consciousness at all and there are no reflex disturbances which are so annoying as when the double images are distinct.

Strabismus, to give the technical name to squint, is mentioned in the earliest medical writings. It was not until the nineteenth century, however, that the way to surgical treatment of strabismus was opened by research on the anatomy and physiology of the nerves and muscles of the eye. When the structure of the eye and the function of its muscles became known, a period of actual discovery in means of surgical correction followed.

Donders, (2) during the latter half of the nineteenth cen-

tury, contributed to the ætiology of strabismus the following facts: (a) *strabismus convergens* almost always depends upon hypermetropia; (b) *strabismus divergens* is usually the result of myopia.

The most important contribution to the study of strabismus in the last half of the nineteenth century was the addition to the stock of anatomical knowledge of the muscles and their insertions and a deeper insight into their functional relationships.

The operations at that time consisted of two steps: (a) tenotomy or setting back of the tendon of the deviating muscle; and (b) advancement of the antagonistic muscle.

The disadvantage of these methods is that only one eye is operated upon at a time. Now, functional strabismus is bilateral and both eyes should be operated on at the same time when it is possible. This last method of operating by one intervention is the contribution to the correction of squint offered by Panas (3).

The twentieth century has seen a marked departure from the accepted theories of the previous generation. The belief that amblyopia exists from birth and is one of the *causes* of the deviation has been changed; most ophthalmologists at present are of the opinion that amblyopia exanopsia is produced as a *result* of squint and that it is not concerned in causation.

Wootton (4) does not uphold this reversal of opinion and still regards amblyopia as congenital and ætiological in squint. He is furthermore of the opinion that the importance of binocular single vision has been rather overestimated. Even when there is no amblyopia present in the squinting eye, Wootton regards the single or double tenotomy as the best operation. When the squinting eye has vision of $\frac{3}{8}$, when the globes are fairly prominent, when the technic is perfect and the operation does not leave noticeable disfigurement, Wootton recommends advancement of both externi, as advocated by Landolt (5).

A signal change came in the attitude of ophthalmologists toward the ætiology of squint with the reports of Claude Worth (6) upon his investigations of the *fusion sense*. This refers causes to the visuomotor centers; that is, strabismus is the outward expression of a lack of coördination in the visual

apparatus. Coördination refers to the relation between the mind and the body. The factors that predispose to strabismus are two: (a) a *central defect*, some degree of arrest or embarrassment in the fusion faculty (visuomotor centers); plus (b) a peripheral defect, represented by a refraction error that only serves to aggravate the innervational disturbances already present. Other factors are anatomical anomalies (usually congenital), opacities in the media, and low-grade central choroidoretinal lesions.

Reber (7) believes that the two important measures in non-operative treatment consists of an initial correction of the refractive error and a final cultivation of binocular single vision. He is of the opinion that operative treatment should be postponed, as a rule, until the ninth or tenth year.

Reber's methods of non-operative treatment are interesting and are here briefly described: The angle of deviation is first determined, and for this purpose the linear method of Graefe is utilized. To determine the refractive status, Reber advocated atropia and retinoscopy, working at twenty inches and holding the lenses in the hand before the eye. After accurate refraction, the real treatment only just begins. Accommodation is prevented by the daily morning use of a drop of two grains to the ounce of atropine solution dropped into each eye, for three months after the correction has been put on the patient. In addition, invisible bifocals, after the suggestion of Linn Emerson (8) are ordered. A plus 3.00 sphere added to the distance correction is worn in the lower segment for a year, thus keeping the accommodation completely at rest. The following year this is reduced to plus 2.00 sphere, after another year to plus 1.00 sphere, and, finally, in another year the distance correction only is worn.

Immediately following this, the cultivation of the dormant fusion faculty is begun. "In the true alternating type of strabismus this will no doubt prove unavailing, and this type constitutes the one exception to the rule which provides that esotropic children should not be operated on before the ninth or tenth year. The two other types, namely incomplete binocular and complete monocular esotropia, are the relatively frequent ones and are susceptible to fusion training" (7).

Worth's amblyoscope pictures are so arranged as to train

fusion sense through three grades of binocular vision; (a) simultaneous macular perception, (b) true fusion with some amplitude, and (c) sense of perspective. "The non-operative treatment of strabismus when successful," writes Reber, "achieves a perfectness and a beauty of result seldom accomplished with the scissors (that is, straight eyes with full binocular vision), while even if it fails at this ideal result, it furnishes the ideal preparation for operation, in that it reduces the amount of operative work that may be necessary in any case and offers to the surgeon greater certainty and hope of a favorable operative result, if this becomes necessary" (7).

Hansell (9) curtly expresses the opinion that non-operative measures should be tried first, and sufficient time allowed to prove their uselessness before operation is decided upon. In esophoria he advises operation if asthenopia persists beyond the point of cure by medicinal and optical measures. This operation should be double tenotomy, subconjunctivally, with due regard for the effect of the division of each fiber, resting when an over-effect of two or four degrees is obtained. Both operations should be done at one sitting under local anæsthesia. In esotropia, the best results are obtained by double external advancement, provided that a divergence of ten or fifteen degrees is first secured at the time of operation and the eyes are bandaged for three days. The patient should wear a full or nearly full correction, and remain under observation. Amblyopia which is always present in the squinting eye is congenital and cannot be more than slightly improved by the methods in general use. The purpose of the operation can be only cosmetic.

Dunnington (10) has a theory that the existence of divergence is a function distinct from external rotation, and that convergence is not simply an act of internal rotation but that it is a distinct entity; that is, the performance of these movements is controlled by cerebral centers. The purpose of the two operative procedures in general use are two: (a) the weakening of an over-acting muscle; (b) the strengthening of an underacting muscle. To increase the action of a weakened muscle the following procedures are resorted to: (a) the tendon can be shortened or resected; (b) the insertion of the

muscle can be carried further forward (near the limbus). In squints of long standing it is frequently necessary to combine a resection of one muscle with a tenotomy of its antagonist. The belief that squint can be outgrown or that it corrects itself is based upon the fact that pseudo-squint is a common condition.

Delogé (11) finds (as my article fully demonstrates) that there is a wide diversity of opinion both as to the nature and the treatment of strabismus. I may remark parenthetically and before continuing to discuss the theories of Delogé that *where doctors disagree there is, without doubt, some central truth which has either been but faintly perceived or else not discovered at all.* In the case of strabismus the theories are still in an evolutionary state. Delogé, for example, states that a strabismus was for some time, during the evolution of theories, regarded as of muscular origin, thereby confounding it with deviation or squinting, which is an important symptom, although neither characteristic, nor always present. For *convergent strabismus* Delogé urges reëducation of the binocular vision as an essential feature. In *divergent strabimus*, he is of the opinion that orthoptic treatment ensures the most rapid and brilliant result.

It is the more recent knowledge we have in regard to the nature and treatment of squint that interests us here and we have seen how widely opinion varies. But to me it seems that two conclusions are inevitable: (a) anomalies of this character in vision should be first corrected by refraction if possible. This is sufficient in many cases in which deviation is of the periodic variety. If a convergent squint is beginning to develop in a hyperope, all the hyperopia should be corrected, with a small deduction of astigmatism (if excessive) in those who have never worn glasses. (b) Operation is a last resort and the relief it affords is in most instances simply cosmetic. And relief from disfigurement is often what the patient most desires. With the foregoing considerations before him the author addressed himself to the development of an operation that he hoped might be relied upon to effect cosmetic correction, even where it could not hope to improve vision.

It seemed to him from the mechanics of the eye that where operative interference was indicated a resection or tenotomy

alone was insufficient in every case to enable one to discontinue wearing glasses without detection of defect or discomfort. A resection of a frail undeveloped muscle, handicapped already in that its antagonist is two to three times stronger in muscle strength, is unscientific and unpardonable without a total tenotomy, the readjustment of which preventing not the least bit of exophthalmus, sinking of caruncle, or feebleness of motion, while looking in all extreme directions.

The cases of divergent strabismus often have a weakened, thinned, and undeveloped internus and a hypertrophied externus. In the divergent cases only one eye as yet has been operated. Resection of externus and tenotomy of internus is done, but more convergence is made with anchor which is passed through Tenon's capsule three *mm* from outer limbus and made fast to nose with adhesive strip. My (2) modification of Reese's resection is to pass a No. 10 silk suture into the muscle proximal to the Prince Forceps, but not until the tendon has been divided at the scleral attachment, just the opposite procedure to that of Reese, but causing the severed edges of both stump and muscle not only to come together but actually bend at right angles to plane of sclera with their cut ends pointing outward. Not one of the thirty-two cases showing any tendency to slip or relax in the least from underneath the stump. Sutures are passed through conjunctiva and two *mm* from limbus and tied securely. The tenotomized muscle is held in Prince Forceps and a number five (5) silk suture passed through muscle proximally to forceps and into sclera from three to twelve *mm* from stump and brought out and ties over conjunctiva two *mm* from limbus. Done by the open method, it is necessary to close all conjunctiva openings with No. 5 silk. Anchor either to bridge of nose over several layers of adhesive, or strap over to temple as the case may justify. This anchorage is best obtained by passing a number 13 silk suture underneath the conjunctiva as close to limbus as possible. Pressure bandage over both eyes, changed every twenty-four hours for three consecutive days. Keep anchor taut until removal on the fourth day. Large scleral sutures should remain in position from twelve to thirty days owing to the amount of scar desirable at attachment.

Local anæsthesia is used for all cases except the excitable

type. The youngest operated in series under local was six years of age. No interruption on account of pain.

No. 1. January 10, 1920. J. C., 16 years. (Figure 1.)
R. $\frac{3}{8}$, L. $\frac{3}{8}$.

History.—R. Eye turned outwards since eight years of age. Headaches.

Refraction.—OU — 0.5 C 90 AU = $\frac{3}{8}$. Status. Divergent Strabismus 35°. Muscle Strength. Total Convergence 30° feeble in action. Total Divergence 45°.

No. 3. Jan. 24, 1921. E. L., 11 years. R. $\frac{3}{8}$ + 4.0 Sph. $\frac{3}{8}$. L. $\frac{1}{2}$ + 5.0 Sph. $\frac{2}{8}$.

History.—Since two years of age L. eye crossed to nose. Can't see well to study. Status: Convergent Strabismus 20°. Muscle Strength. Total Convergence 50°. Total Divergence 40°.

No. 4. May 3, 1921. E. B., 8 years. R. $\frac{3}{8}$ + 4 Sph. $\frac{3}{8}$; L. $\frac{2}{8}$ + 6 Sph. $\frac{2}{8}$.

History.—L. eye crossed to nose since baby. Status: Convergent Strabismus 40°. Muscle Strength. Total Convergence 55°. Total Divergence 35°.

No. 5. Oct. 22, 1921. Geo. G., 13 years. R. $\frac{1}{8}$ + 5.0 = 0.5 C 90 $\frac{1}{8}$. L. $\frac{3}{8}$ + 3.0 = 0.5 C 90 $\frac{3}{8}$.

History.—R. eye crossed to nose since three years of age. Status: Convergent Strabismus 50°. Muscle Strength. Total Convergence 55°. Total Divergence 35°.

No. 7. August 21, 1921. C. B., 12 years. R. $\frac{1}{8}$ + 5.5 $\frac{1}{8}$. L. $\frac{3}{8}$ + 5.5 $\frac{1}{8}$.

History.—Since two and a half years of age R. eye crossed to nose. Got tired easily in school.

Status: Convergent Strabismus 35°. Muscle Strength. Total Convergence 50°. Total Divergence 40°.

No. 8. Dec. 21, 1921. S. J. S., 20 years. (Figure 3.). R. $\frac{5}{8}$ + 2.5 Sph. = $\frac{5}{8}$. L. 5.6 + 0.5 Sph. = $\frac{5}{8}$.

History.—Right Eye crossed to nose since baby. Status: Convergent Strabismus 45°. Muscle Strength. Total Convergence 55°. Total Divergence 30°.

SUMMARY

In all cases thus far operated:

1. Glasses have been discarded altogether.

2. The final results have been such that it could not be discerned that the eye had ever sustained any deviation of musculature.

3. There has developed no tendency to recur.

4. The strain on convergence incident to accommodation has not asserted itself, even when the error of refraction is considerable and left uncorrected.

5. Synchronism is maintained even when the vision in the squinting eye is reduced as low as "fingers at two feet" and it is believed that full cosmetic correction can be had even in the absence of light perception.

6. Most patients have taken on a happier mien and several have gained ten to twenty pounds in the few weeks following the operation. After a few months all discoloration and scars of conjunctiva have vanished. Increase in weight and body strength enabled patient to accommodate without discomfort in hypermetropia up to four and five.

Except for a few days following operation double vision is not noticeable, especially in the convergent type, no noticeable exophthalmus has followed this operation.

7. Several cases under observation at present including some of the first operated since three years ago are improving with age.

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A CASE OF ORBITAL ABSCESS PRODUCING A CLINICAL PICTURE OF SEPARATION OF THE RETINA. PATHOLOGICAL FINDINGS, INCLUDING AN ANÆMIC INFARCT OF THE OPTIC NERVE.

BY DR. ROBERT CARTWRIGHT CHENEY, BOSTON, MASS.

(FROM MASSACHUSETTS CHARITABLE EYE AND EAR INFIRMARY.)

(With two illustrations on Text-Plate XXVIII.)

CASE: On August 25, 1921, a well-developed and nourished boy of ten years came to the Infirmary and was admitted to Dr. G. S. Derby's service with a tentative diagnosis of an abscess of the right orbit. The history and clinical findings were as follows:

Family History.—Father living and well—very deaf and myopic. Eight children living and well.

Past History.—The only infectious disease that the patient has had is diphtheria, five years ago. Eyes negative until present illness. Sight good. Ears—otitis media two years ago. Throat—negative. Nose—no history of discharge, colds, etc. Teeth—negative. Gastro-intestinal—appetite fair—no vomiting except as noted below. Bowels regular. Cardio-respiratory—no cough; dyspnea; precordial pain; palpitation or oedema. Neuro-muscular negative. No chorea; rheumatism, etc. General condition good up to present illness. Skin—subject to boils.

Present Illness.—Began about six weeks ago with headache located in the right temporal region. Has had dull pain in and about right eye, which was severe enough to keep him awake. Radiated at times to right parietal region. Patient thinks vision has failed gradually in right eye. Slowly increasing exophthalmos during the past week. No fever noted. No cold in head or nasal discharge. Patient vomited one time after riding in street car one week ago. Patient has been drowsy during entire illness and father has noticed a slow pulse—about 60. Condition getting

ILLUSTRATING DR. ROBERT C. CHENEY'S ARTICLE ON "A CASE OF ORBITAL ABSCESS, PRODUCING A CLINICAL PICTURE OF SEPARATION OF THE RETINA."

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FIG. 1.—Cross section of globe, nasal wall of which is pressed in by abscess. Thickened choroid. Infarct of optic nerve.



FIG. 2.—(Low power) Infarct of optic nerve.

progressively worse. Patient seen by oculist who made a diagnosis of tumor of orbit and referred him to Eye and Ear Infirmary where he arrived this evening.

Physical Examination.—Right eye: Lids and lacrimal apparatus normal. There is a marked exophthalmos, the eye being shoved somewhat downward—with marked limitation of motion in all directions. Conjunctiva—slightly injected and only slightly chemotic. The cornea is clear. Anterior chamber fairly good depth—pupil widely dilated—does not react to light or accommodation (atropine). Iris—normal in appearance. The media are clear. The fundus shows greatly engorged and tortuous veins with an apparent separation of the whole nasal $\frac{1}{2}$ of the retina, which is grayish-white with typical wrinkling, etc., coming up from the disk, in an absolutely perpendicular manner. The separated surface being parallel to optic axis. This apparent separation is not mobile and does not transilluminate at all. Rare hemorrhages on surface. The remainder of the fundus showed a slight but perfectly definite oedema of the retina. Tension 12mm. Vision nil.

Left Eye: Lids and lacrimal apparatus normal. Conjunctiva white and quiet. Cornea clear. Pupil widely dilated. Does not react to light or accommodation (atropine). Media clear. Fundus normal. Tension 20mm. Vision $\frac{3}{8}$.

August 26. To-day X-ray report was the following: "Right antrum very much clouded—pus. Rest of sinuses clear." The chemosis is more marked—the eye pushed down and out and a preauricular gland noticed. White blood count 25,000. Temperature 101.8. On the strength of the above findings the process was considered to be an infection, with pus in the orbit, probably originating from a sinus. Operation, in conjunction with a rhinologist was decided upon and performed in the following manner:

Operation.—Exploration of antrum, inner portion or orbit and ethmoid region (on right side). Enucleation right eye. Patient recumbent—head slightly raised. Post-nasal plug inserted. Face sponged with alcohol and draped. Large gauze sponge packed into right side of mouth. Ether administered via vaporizer held in right side of mouth.

1. With upper lip pulled upward, incision 2 in. long, horizontal, made through gingivo-labial fold of mucosa of right upper jaw. Periosteum scraped upward and downward. Mallet and chisel followed by bone forceps used to break open and enlarge opening into right antrum. Small amount of thick secretion found in antrum—antral walls everywhere intact and healthy. Nasoantral wall not opened. Gauze pack inserted into antrum.

2. Curved incision 2 in. long made through skin and periosteum of upper part of right side of nose. Periosteum retracted. Free hemorrhage checked by hæmostats. Periosteum of whole of inner wall of orbit and of about $\frac{1}{3}$ of roof of orbit elevated—easily. No evidence discovered of any disease of bone so exposed. Mallet and chisel and bone forceps used to open right side of nose, through opening so formed ethmoidal cells curetted. No evidence of pus or polypoid material. Nasal skin wound closed by four interrupted sutures. Ligatures previously tied around two bleeding points. Skin wound dusted.

A small incision made in the conjunctiva at inner limbus at about 2 o'clock. Conjunctiva which was thickened, friable, and infiltrated, dissected up. Tenon's capsule adherent to globe. Probe inserted along inner part of globe and dark yellow pus obtained. It was then decided to enucleate which was done with great difficulty as the whole inner half of the globe was adherent to Tenon's capsule and orbital tissue. A good deal of pus obtained—which came from inner part of orbit. Practically no bleeding. Tissues infiltrated and friable in inner part of orbit.

August 27. Wounds clean; moderate amount of chemosis and swelling. General condition excellent. No pain. Culture—taken at time of operation—shows profuse growth of staphylococcus aureus. Wassermann negative.

September 8. After uneventful convalescence patient was discharged to Out-Patient Department. Socket well healed. Wound in skin on nose healed.

Thus there remained two obscure points to be explained.

(1) The peculiar separation of the retina which did not transilluminate.

(2) Complete loss of vision in the affected eye, light perception even absent.

I am greatly indebted to Dr. F. H. Verhoeff for the pathological findings and the photomicrographs.

Pathological Diagnosis.—Orbital abscess. Compression of globe. Chronic inflammatory infiltration of sclera and choroid. Anæmic infarct of optic nerve behind lamina cribrosa. Marked papilloedema.

The globe is distorted, the nasal wall from the disk to a point somewhat anterior to the equator being pushed in, evidently by pressure of the abscess. In this situation the sclera is thickened to about 1mm and moderately infiltrated

with pus cells. The scleral vessels are giving rise to actively proliferating capillaries. From the external surface of the sclera there is an active formation of granulation tissue richly infiltrated with pus cells and here and there containing dense foci of pus cells. In these foci the Gram stain shows numerous groups of staphylococci. The choroid contiguous with this part of the sclera is markedly congested and densely infiltrated with lymphocytes. The dilated veins contain numerous pus cells which are usually massed along their walls but there are almost no pus cells in the stroma of the choroid. The suprachoroidea shows marked proliferation of its fixed cells. As a result of this chronic inflammatory reaction the choroid is $\frac{1}{2}mm$ thick. The choroidal involvement gradually fades out anteriorly and almost disappears at the ora serrata, although the ciliary body on the nasal side shows an appreciable infiltration with lymphoid cells. The involvement continues on the temporal side in diminishing degree to about the equator. The sub-choroidal space is not distended at the fundus, but on both sides shows slight distention with serum in the vicinity of the ora serrata, the distention being greatest on the temporal side. The retina is everywhere in situ. It is greatly congested and shows an occasional small hemorrhage, but is free from oedema and cellular infiltration. The optic disk is swollen $1mm$ but is free from cellular infiltration. Its vessels show active proliferation with formation of new capillaries. There are interstitial hemorrhages beneath the surface of the disk. Just behind the lamina cribrosa the optic nerve shows an area of necrosis. This occupies almost exactly the upper half of the nerve, the central vessels, however, escaping, and extends backward $1\frac{1}{4}mm$ from the lamina. This area stains much more strongly in eosin than the normal nerve, and within it all nerve tissue is in the process of disintegration. The nuclei all show necrosis in various stages, as manifested by pyknosis, fragmentation and karyolysis. The area is free from cellular infiltration. Posteriorly many engorged capillaries may be seen extending a short distance into the area. On the nasal side granulation tissue is beginning to invade it from the pia and sclera. One half mm behind the area of necrosis, the nerve as seen in cross sections stained in hæmatoxylin and eosin, appears absolutely normal. The central

vessels, examined in serial cross sections, are engorged, but otherwise normal.

The cornea, iris, and lens are normal. The canal of Schlemm is distended with blood on both sides. On the temporal side the ciliary body is normal. On the nasal side it is greatly congested and slightly infiltrated with lymphoid cells in its muscular portion.

The above report explains the clinical findings. The globe was forcibly compressed between the outer bony wall of the orbit and the abscess situated nasally. The force was sufficient to press in the nasal $\frac{1}{2}$ of globe almost to the center line and the choroid of this region densely infiltrated, seen through the transparent retina, gave the clinical appearance which was mistaken for a separation of the retina.

Now the most interesting feature, which might account for the total absence of light perception, was the infarct of the optic nerve. A review of the literature was made but no similar case accompanied by a pathological examination could be found.

There are many cases reported of optic atrophy following abscess of the lacrimal sac, orbital phlegmon, etc., H. Villard (1), Jean Galezowski (2), Truc (3), Boyd (4). Elschmig (5), mentions an inflammatory thrombosis of vessels of the optic nerve in inflammations of the orbit. No microscopic findings were described. Birch-Hirschfeld (6) in speaking of changes in the optic nerve in orbital processes, mentions two cases, one of orbital phlegmon in which sections of the optic nerve showed an infiltrating, interstitial neuritis, lymphocytes and leucocytes being present in the optic nerve, the other, also a case of orbital inflammation in which the damage to the optic nerve was merely by mechanical means. Sourdille (7) investigated a case of orbital phlegmon where the nerve showed obliteration of the central vessels through proliferation of the intima. In these areas of proliferation numerous streptococci were demonstrable. Bull (8) reports a case of orbital phlegmon, in which the optic nerve showed evidence of an intensive neuritis, with a few nerve fibers intact in the central part of the optic nerve, the greater part of which, however, had been replaced by organized inflammatory tissue.

Thus the above are some of the pathological findings in the

optic nerve found in cases of orbital inflammation. Our findings were in no way similar to any of these. The optic nerve showed an anæmic infarct, very discreet and well localized with absolutely no inflammatory cell infiltration, the absence of which, of course, precludes any question of septic embolus.

The question now arises as to which vessels supply this portion of the optic nerve immediately back of the lamina cribrosa. According to Parsons (9) the optic nerve from the place of entrance of the central vessels to the lamina cribrosa is supplied by perforating branches of the vessels in the sheathes of the nerve, and also by branches from the central vessels; Salzman (10) speaks of the central vessels giving off a few branches, mostly veins in the optic nerve trunk, he states that the central artery gives off a large number of fine branches only at the lamina cribrosa and considers the part of the central artery in supplying the optic nerve to be a minor one. Therefore, also considering that the central vessels were normal in our sections it seems obvious that the vessels, whose involvement caused the infarct, must have those coursing in the pial sheath of the nerve. These vessels according to Parsons (9) are derived from the pia mater of the brain, reinforced by inconstant branches of the ophthalmic artery.

As to the origin of the infarct of the optic nerve, it seems probable that the vessels which supplied the involved portion of the optic nerve were obliterated either by septic thrombosis or by toxins from the inflammatory process. Considering that the abscess extended well back to the posterior pole of the eye, and the region of the optic nerve, this view appears quite tenable. Now the question arises as to whether the infarct of only half the nerve would account for the total loss of vision. Dr. Verhoeff believes that the toxic products of the infarcted area were sufficient to destroy the functional power of the remainder of the nerve. This theory seems perfectly plausible, but, as only a relatively small portion of the nerve was obtained for examination, there is no way of proving whether or not there was also some inflammatory or toxic involvement of the optic nerve further back in the orbit, although this is unlikely from the fact that abscess was immediately behind the globe and the portion of the nerve examined was free from inflammation, although the nearest to the abscess.

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CASE RECORDS IN OPHTHALMOLOGICAL CLINICS.¹

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NEW YORK.

THERE is considerable published material on the value of complete and accurate medical records in hospitals, but the discussion of out-patient department records is a neglected field. The dearth of published material regarding the desirability of good dispensary records is due, no doubt, to a general lack of appreciation of the significance of the out-patient department, both in its relation to the hospital and to the community. The more recent consideration of the importance of the dispensary forces recognition of the necessity of not only improving the service in this department, but of keeping better records of service.

The literature on hospital records presents many convincing arguments why complete medical histories are essential. Mr. J. G. Bowman, of the American College of Surgeons, in an article on "Case Records and Their Use" (1) asks the question: "What element are the records in the success of a hospital? If case records are essential to good hospital service, just why are they essential?" And his comprehensive answer applies to dispensaries just as forcibly as to hospitals: "The hospital exists for the patient. Let us assume that the hospital seeks to give worthy service to every man, woman and child admitted to its care; that in return it seeks the confidence, goodwill and even the financial aid of its community. Rational and convincing evidence as to the hospital's service is wanted by the public—because of its very importance the hospital is

¹ Read before Section on Ophthalmology, New York Academy of Medicine, December 18, 1922.

under fire of criticism. In some practical fashion it must account for efficient performance in every department. How shall the hospital make this accounting? Well, results are what count, and results are to be found in case records. Facts, facts, facts in the relevant personal history of each case, facts developed in the physical findings, facts brought to light by the laboratories and X-ray, facts deduced through pliable wisdom from all of these and expressed as diagnoses—these are the foundation of the hospital or clinic. Unless the hospital as a matter of institutional policy is in possession of these facts, filed in orderly fashion in justification of its work, it is entitled to little credit in its community or in the medical profession. . . . A good record consists only of such facts as will be of worth to the patient in the study and treatment of the case; and to the profession for its information in the treatment of similar cases in the future.”

Another strong plea is made for good records by J. M. Baldy, Commissioner of Public Welfare of Pennsylvania, in an article, “Meaning of Case Records” (2). He states that the records are educational to other physicians and to nurses as well as to the attending clinician. “Further, they are educational to the board of managers as well as to their agent, the superintendent. They are a protection to the institution against suits for damage. They are an assurance to the patient of proper treatment. They are an assurance to the public who contribute to the support of the hospital that their money is being properly and helpfully expended. Case records not only demonstrate whether or not the physician is giving proper attention to thorough-going and exhaustive diagnoses but actually secure this most desirable result by creating the consciousness of an open record which is regularly checked up. Last but not least they are most helpful, through potential research, in the advancement of medical knowledge and therefore useful to the whole world.”

There seems to be no lack of evidence on the value of good case records. The reasons for keeping clinical records are briefly summarized by the Committee on Hospital Forms and Records of the American Hospital Association as follows (3):

“1. To show at any later date an accurate record of the professional measures instituted in any given case.

"2. To provide a basis for the analysis of the work of attending physicians and surgeons.

"3. To provide a basis for research and study in medical practice.

"4. To provide a means of instructing medical students in the proper method of making a diagnosis.

"5. To provide the attending staff with a written record of the patient's progress.

"6. To enable the hospital to fulfill its obligation to the patient in providing such record upon request.

"7. To provide a basis for legal evidence if needed.

"8. To stimulate adequate and competent service on the part of the attending physicians and surgeons."

Considerable effort has been made during recent years by the American College of Surgeons, the American Medical Association, the American Hospital Association, etc., towards the improvement of hospital records. The Public Health Committee of the New York Academy of Medicine in its study of dispensaries in 1918 demonstrated the need for better out-patient records and made many valuable suggestions for improvement (4).

Under the direction of the Section on Ophthalmology of the Associated Out-Patient Clinics of New York we recently made a study of five hundred medical histories, 50 from each of ten representative ophthalmological institutions in New York City. This study clearly demonstrated the deficiencies of present methods of record keeping. Only three of the institutions attempt a routine method of history taking. In the other institutions each man follows his own method, which, from the data recorded on the medical records, is usually decidedly unsatisfactory. Of the five hundred records analyzed, history was recorded in only 55%; a tentative or final diagnosis in 68%; treatment in 76%; vision in 78%; refraction in 45%; muscle examination in 44%.

The proportions given above do not indicate the total inadequacy of the records in some institutions. In one clinic 68% of the histories presented neither tentative nor final diagnosis; in one institution 92% of the records showed no history; the treatment instituted was not recorded for 47%

of the medical histories in another clinic, and vision was noted on only half and refraction on one quarter of the records in still another institution. We will all agree that such medical histories fall lamentably short of meeting the requirements stated previously. They obviously do not provide a satisfactory record of "previous professional methods instituted" to guide the physician treating the patient at a later date. We physicians who are responsible for these records should not care to have them used by the trustees as "a basis for the analysis for the work of attending physicians and surgeons." As a basis for legal evidence, our records would be of dubious value. As a "basis for research and study in medical practice" or as a means of instructing medical students, such records are practically worthless. In fact only one clinic of those visited makes their histories available for teaching and study by a system of cross indexing interesting cases by disease.

The fundamental importance of reliable case records being granted and the existing practice as we have studied it in our representative institutions having been found exceedingly defective, we believe that the physicians who are interested in improving conditions for themselves and in rendering better service to patients should agree upon the elements of a satisfactory record system and make every effort towards having these principles put into effect in our clinics.

We suggest the following principles of record keeping for your comment and criticism:

- I. Each clinic should adopt definite standards for the content of records.
- II. Responsibility should be fixed for the supervision of records: for their accuracy, completeness and proper care.
- III. All records should be filed centrally.
- IV. All the records of each patient should be filed together.
- V. The records of the in-patient and the out-patient department should be unified as completely as possible.

I. Standards for the content of records should provide for all the information necessary to the proper understanding of the physical condition and the social problems of the patient,

and adequate notes on the care and disposition of the case. Such standards should include the following:

1. Identifying information, etc., *i.e.*, name, address, age, sex, nationality, occupation, habits, social condition, heredity, name of friend or relative, name of physician treating patient.
2. Patient's history.
3. Findings on physical examination.
4. Results of laboratory tests, X-ray examinations, or other special tests.
5. Provisional or final diagnosis.
6. Treatment, including reference to hospital social service or other reference.
7. Progress and results.

II. Unless someone is charged with the responsibility of seeing that records are accurately and completely filled out and properly filed, the adoption of any standards for content of records will prove futile. Records should be systematically and carefully reviewed to determine whether they meet the specified requirements. In some institutions the members of the medical staff rotate in assuming this responsibility for their respective services, reporting results both to individual physicians, and at clinical conferences. In other clinics this duty devolves on the nurse in charge or a specially trained secretary. It seems more fitting to have defects in records brought to the attention of physicians by their colleagues rather than by a nurse or secretary. The actual review of records, which involves considerable detail work, may well be done by some member of the staff who is not a physician.

III. In order that there may be central responsibility for the completeness of records, all records must be filed in a single place, not in individual clinic rooms. Such central filing also makes possible the combination of all information about a single patient, as provided for later; central responsibility for filing; a central alphabetical file for identification purposes; and a central diagnostic file.

IV. All records of each patient should be filed together in a single place, that is, all information about John Smith, who may be attending two or more clinics, and also be under the

care of the social service department, should be incorporated in a single record, or at least the various records filed in a single folder. The value of such centralization of information is at once apparent to any physician who has been responsible for the care of patients who are also being treated in another department. Each department is without definite information of the findings or treatment of the other unless a strenuous effort is made to secure such information.

V. The unification of in- and out-patient records is really only the complete application of the previously stated principle providing that all information about each patient should be filed in a single place.

Many factors are involved in the application of the above stated principles, most of which require the coöperation of the administration of institutions; and some of which require the provision of extra clerical personnel. Quoting from a report of the American College of Surgeons, 1922 (5):

"How then, can the possession of a complete record be facilitated? Its accomplishment requires the mutual co-operation of the hospital and its staff members."

"The duties of the hospital in this connection, consist, first of all, in supplying adequate personnel to secure the records."

Physicians who are giving their time to clinic work under conditions existing in the average out-patient department today (too many patients, too few physicians, inadequate and poorly arranged equipment, etc.) can scarcely be condemned for not keeping scientific case histories. Trustees should expect their medical staff to keep complete and accurate medical histories only when reasonable assistance in the keeping and filing of records is provided.

CONCLUSIONS.

The study of the literature on the subject of case records and the review of 500 records in ten ophthalmological clinics in New York City justifies the following conclusions:

1. It is important that case records should be carefully

written, filed and indexed, to aid physicians in treating their patients more intelligently, to provide valuable data for reference and research, to give boards of managers and superintendents a valuable guide as to the character and quality of medical service rendered and to assure the benefactors that their money is being helpfully expended.

2. The case records in representative New York ophthalmological clinics are not as a rule satisfactorily written and indexed.

Existing conditions can be improved only through the combined efforts of hospital authorities and clinic physicians. Each clinic should adopt definite standards for content of medical histories. Responsibility should be fixed for the supervision and care of records.

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2. *Modern Hospital*, 1919, xii., 178-180.
3. *Modern Hospital*, September, 1922, p. 227.
4. "New York Dispensaries: Book and Record Keeping," reprinted in *Modern Hospital*, July and August, vol. xv., Nos. 1 and 2.
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REPORT OF THE PROCEEDINGS OF THE SECTION
ON OPHTHALMOLOGY OF THE NEW YORK
ACADEMY OF MEDICINE.

By DR. BEN WITT KEY, SECRETARY.

MEETING OF NOVEMBER 20, 1922. DR. J. M. WHEELER, CHAIRMAN.

DR. MARTIN COHEN reported a case of **amaurotic family idiocy** in an infant of non-Jewish parentage. Appeared in full in preceding issue of the ARCHIVES.

Dr. Cohen pointed out the following deductions from the case report. 1st. That unless a fundus examination had been made, the diagnosis may have been overlooked, the patient being non-Jewish. 2nd. Fundus examination is essential in aiding diagnosis in general nervous diseases in all infants. 3rd. Fundus picture is typical, and not to be differentiated. 4th. This case and similar ones change the accepted opinion that infantile amaurotic family idiocy occurs exclusively in children of Jewish parentage.

DISCUSSION: DR. BERNARD SACHS said he had been interested in this disease for the past thirty-five years and was one of the first to present the disease as a clinical entity. He had previously stated that it occurs only in the Jewish race and he has seen many of these cases, perhaps six or seven every year, and only about two weeks before had seen the first case of the disease occurring in a child of non-Jewish parentage:

He did not know why it should manifest itself only in the Jewish race. It represents the most extreme and widespread degeneration of the cellular nervous elements—there does not appear to be a normal ganglion cell throughout the whole nervous system. Only a few cases do not show the typical ocular picture. Sometimes it occurs without the cherry-red spot, but there is atrophy of the optic nerve.

The child usually appears normal up to about a year to four years old, when the degeneration begins—deterioration in every respect, loss of power, listless, the eyes affected at an early date. An interesting and striking fact is that the child is invariably handsome, chubby and in the best of health up to the time the process of degeneration begins.

Some years ago it was believed to be a disease of toxic origin, but there had been much discussion on this point. He is convinced through his experience that it is a widespread degenerative disease of cellular nervous elements. Death occurs in the course of two or three years.

DR. HERBERT W. WOOTTON had examined the case presented by Dr. Cohen, and confirmed the diagnosis as unquestionably one of amaurotic family idiocy. The disks were atrophic, there was marked oedema of the macula, and a cherry-red spot in the fovea of each eye. The child was listless and unable to support the head. The parents, both of whom were seen, were Italian Christians.

DR. W. E. LAMBERT presented a case of **detachment of the retina** on whom he had performed a trephining operation. Patient had a myopia of 18 D. both eyes. Operation was performed June 19, 1922. There was immediate replacement of the retina and restoration of fields and vision, which condition remained until October, 1922, when he found that there had been a re-detachment in the lower inner quadrant. Vision, however, was still $\frac{2}{200}$, but instead of a myopia of 18 D. there existed only 3 D. This rather curious change could be in his opinion only accounted for by the anteroposterior axis of the globe, or a recession of the lens into the vitreous body. When he planned to present this patient before the Section, he was of the idea that at last he had met with success in a trephining operation for detachment, but this case unfortunately turned out to be in line with previous experiences.

DISCUSSION: DR. ISAAC HARTSHORNE had trephined and aspirated several of these cases with the usual result of immediate recurrence. In one case of minus twenty diopters of myopia trephined within twenty-four hours after detachment came on, the retina stayed replaced for about five months without recurrence. At the end of that time the patient was struck in the eye by a ball, and examination

revealed a re-detachment of the retina. He believes this case would indicate that trephining should be made at the earliest possible moment after detachment.

DR. E. F. KRUG had trephined four cases of detachment of the retina and without any permanent result. One case he trephined four times—after the first trephine there was replacement and vision was very good for two weeks, after second trephine vision returned for five weeks. He believes trephine should be performed and perhaps repeated.

DR. B. W. KEY referred to two cases which he had trephined for detachment; in one case, only temporary replacement resulted; in the second case, young woman, hypermetropic, trephined two days after it occurred replacement remained for three months, and vision (previously $\frac{2}{200}$) restored to $\frac{3}{80}$ gradually became reduced from atrophy and flat detachment of the retina—vision now, $1\frac{1}{2}$ years after operation, is $\frac{2}{100}$.

DR. L. W. CRIGLER spoke of a spontaneous reattachment of the retina in a case of myopia.

DR. H. W. WOOTTON stated he had seen reattachment of the retina in a case after he had given subconjunctival injections, but he believes it was a spontaneous reattachment and that the injections had nothing to do with it.

DR. W. E. LAMBERT in closing the discussion said he believed trephining should be tried because no other measure seems to benefit these cases.

DR. W. E. LAMBERT presented a case of **aphakia with glaucoma** in a young girl. In October, 1918, she had a perforating wound of the cornea, with incarceration of the iris, and traumatic cataract. Patient was seen six weeks after the accident. The iris was adherent to cornea and pupillary area full of exudate. Iridectomy was made December, 1918. In February, 1919, a de Wecker was made with excellent result—clear pupil and vision = $\frac{3}{80}$ with plus 8.50 combined with plus 3.50 cyl. axis 45. Patient was under observation and when seen in October, 1921, vision was $\frac{3}{80}$ with correction. When seen in March, 1922, the vision was only light perception, cornea hazy, tension plus. Very poor view of fundus could be obtained but a deep excavation of the nerve could be seen. Patient gave history of frequent attacks of mild inflammation and pain in the eye, which were undoubtedly recurrent attacks

of glaucoma. Hot bathing and pilocarpine was prescribed and eye quieted, but tension remained plus and on March 20th the inner pillar of the coloboma was freed by iridectomy. Patient had an interrupted recovery, but the vision was and still is doubtful light perception.

A case of **exudative retinitis—Coates disease**—was presented by DR. RAYMOND C. DODD. W. S., boy, aged 14 years, September 28, 1922, complained of blurred vision in the right eye, first noticed by him some months before. No history of tuberculosis or lues.

Ocular examination.—Vision of O. D. central scotoma. O. S. $\frac{1}{5}$ —pupils equal and active—both direct and consensual. Fundus examination showed an extensive retinitis with scattered whitish atrophic areas of various sizes throughout the periphery of the fundus, and a central area elevated about 2 to 3 D. This mass in the macular region was evenly rounded, of grayish-white color with cholesterin crystals on the surface, its edges were veil-like, over which ran retinal vessels. The tumor appeared like a subretinal cyst. Immediately surrounding the tumor were massive conglomerate atrophic areas. In the extreme periphery of the fundus on the temporal side were noted several small fresh hemorrhages with localized aneurismal dilatations of the small retinal vessels. The vitreous clear. The left fundus was negative.

Laboratory tests were as follows:

Wassermann—negative. Tuberculin—intracutaneous—negative in all dilutions. Urine—negative. Blood count—normal. X-ray of sinuses and teeth,—“There is evidently a mild posterior ethmoiditis with thin septal walls. The teeth are clear.”

On October 27th fresh hemorrhages appeared on the summit of the mass and two weeks later another fresh hemorrhage beneath the veil-like nasal edge of the mass.

He believed that in view of the negative tubercular reactions, tuberculosis may be excluded. From the position and appearance he excluded any intraocular new growth. Removal of the tonsils and possibly cleaning out the ethmoids was recommended. This case falls in the group described by Coates—namely a massive exudative retinitis. In favor of this were the extensive white atrophic areas, the

elevated mass, the fresh hemorrhages, the age of the patient and lastly the aneurismal dilatations of some of the retinal vessels. He welcomed any suggestions as to treatment.

DISCUSSION—DR. L. W. CRIGLER called attention to a case of Coates disease which he reported several years before and which was very similar if not the precise picture as that presented by Dr. Dodd's case.

DR. MARTIN COHEN was of the opinion that the primary pathological process in this case was of vascular origin, and also advised the use of miotics in order to prevent in the future a possible secondary glaucoma.

DR. H. W. WOOTTON presented a case of **pemphigus of the conjunctiva** involving both eyes of a boy nine years old. The first symptom was tearing which began in both eyes eight months before. Then blebs formed on the conjunctiva, followed by redness and chemosis. These symptoms lasted about two months when the eyes became dry, the dryness becoming gradually more marked. No purulent discharge at any time. Health otherwise good. No evidence of pemphigus on the skin or in the throat or nose. Status præsens:—Both eyes practically the same. Extensive symblepharon glueing the lids to the globe and restricting all ocular movements. Both corneas involved and very hazy. Vision reduced to shadows in the left eye and fingers at four feet in the right.

DISCUSSION: DR. MARTIN COHEN asked if this may not be a case of essential shrinkage of the conjunctiva rather than pemphigus, because there was no evidence of pemphigus on the skin.

Dr. Wootton replied that he had never seen a case of essential shrinkage of the conjunctiva, and considered it a misnomer; that these are really cases of pemphigus.

DR. ELBERT S. SHERMAN had shown a similar case before the section about twelve years ago. Thought Dr. Wootton's case was interesting because of the very rapid course.

DR. E. WALDSTEIN asked why not attempt total trephine of the cornea and replace by new or transplanted corneal substance, and referred to cases which he had seen presented in Heidelberg; one, a case of old parenchymatous keratitis in which vision was restored, about $\frac{2}{4}$, by such an operation

performed by Elschnig (the normal cornea taken from an eye-ball destined for enucleation).

DR. WOOTTON replied that he did not know of any case of this sort that had been successfully operated upon in this country.

A case of **hole in hyaloid membrane** was reported by DR. I. GOLDSTEIN. School boy, aged 19 years, complained of blurred vision in right eye for previous three years. Vision of right eye = $\frac{2}{200}$, of left eye $\frac{3}{20}$. The right eye was the seat of a chorioretinitis, ætiology of which had not been definitely determined. The case was presented to show a circular opacity in the vitreous. Above and to the temporal side of the disk was an almost circular path of chorioretinitis, which was about the same size as the circular opacity. This picture is similar to that described by Sir William Lister as a hole in the so-called hyaloid membrane. It is brought about by a shrinkage of the vitreous in which the membrane between the vitreous and retina is torn around its periphery, leaving the central portion of the membrane attached to the area of chorioretinitis.

A case of **recent hole at the macula** was presented by DR. MARTIN COHEN. S. L., aged 24 years, salesman, four years before was struck in the left eye by a fist. He consulted a physician at the time, and the vision which, following the injury, was $\frac{3}{20}$, remained $\frac{3}{20}$ until two weeks before when the patient was again struck in the left eye by a baseball.

November 20, 1922: Right eye normal. Left eye—vision = fingers at one foot,—large central scotoma corresponding to lesion—lids and ocular conjunctiva ecchymotic, pupil moderately dilated and reacts sluggishly to light. Papilla showed slight temporal pallor,—between the papilla and macula was an old sickle-shaped rupture of the choroid having a yellowish gray appearance, covered by retinal blood-vessels, and bordered and partly covered with pigment. At the macula there appeared some thinly scattered pigment, and in its center a sharply defined, characteristic cherry-red spot about one-half the diameter of the disc.

DR. C. BERENS demonstrated an **accommodation rule**; a **diplopia glass**; a **lid everter and retractor**; and an **eye dropper and container**.

The accommodation rule is a modification of the one devised by Prince and modified by Maddox. It resembles the Prince rule in that it may be used for testing the near point of accommodation and has a millimeter scale. It differs from the Maddox rule in that the string is attached from one extremity of the rule, thus permitting the addition of a millimeter scale which may be used separately or in conjunction with the dioptric scale; also the near muscle test is arranged for use at 25cm. and the reading is in prism diopters; a stenopaic hole has been added for rapidly determining the improvement of vision, a wide leather case for use as a screen; a protractor for determining the axis of cylinders has been added; and also large and small colored test objects.

The diplopia glass is a plane monochromatic red, toric lens held in a thin metal rim which extends into a metal handle.

The combined lid everter and lid retractor is of two sizes. It is pliable, small and delicately constructed, and can be used for retraction and eversion of the eye-lids for diagnosis, treatment and for operation.

The combined eye dropper and container permits solutions to be used without contamination of contents. It consists of a cylindrical tube three inches in length and three-quarters of an inch in diameter drawn out to a dropper point at one end with a narrow tubular opening at the junction of the upper and middle third to which an eye dropper bulb could be attached.

MEETING OF DECEMBER 18, 1922.

A paper, entitled, "**Case Records in Ophthalmological Clinics,**" was presented by DR. CONRAD BERENS and DR. GERTRUDE E. STURGES.¹

DISCUSSION: DR. W. E. LAMBERT approved entirely Dr. Berens' views as expressed in his paper, and emphasized the importance of a more careful taking and keeping of records of all clinic and hospital cases.

DR. HOMER SMITH stated that he believed the complete and careful making of case records would be greatly simplified and made certain by requiring the patients to attend the clinic before the regular hour for examination and have a salaried

¹ Published in full in this issue.

non-medical or medical officer, whose duty should be to take a comprehensive history and record the vision of each patient and then classify if possible, and perhaps refract them before the receiving physician sees the patient for study, diagnosis and direction of the treatment of the case. This would save immense amount of time, and give sufficient time for investigation and examination of the more serious complicated cases.

DR. G. W. VANDEGRIFT stated that after all is said and argued on this subject, the answer is found in having paid refractionists for each clinic, so that sufficient time can be given serious medical and surgical cases.

DR. J. W. WHITE felt that the fault is with the attending physicians in not taking the time to record the salient features of a case, both as to history and examination.

DR. JULIUS WOLFF showed a case of **fat implantation nine years after operation.**

Mrs. B. T., in August, 1912, suffered from a very severe case of Basedow's disease with extreme exophthalmos. In the course of a few months the patient was entirely relieved but as the right eye was very disfiguring as result of extensive ulceration and perforation, enucleation with fat implantation was performed in April, 1913. The cosmetic result was such as to make the two eyes look exactly alike when a good artificial eye was worn.

The object in presenting this case was to demonstrate the permanency of the result. There is still present after nine and one-half years a prominent, rounded moveable fatty stump. He was firmly of the conviction, after observing several cases for a number of years, that a well performed fat implantation gives a permanently good cosmetic result. In the case of a boy he implanted too large an amount of fat and waited seven months for it to shrink. Under local anæsthesia he then removed some of the tissue, which, incidentally, was found to have sensation, and obtained a very good and permanent result.

DISCUSSION: DR. B. W. KEY expressed his interest in this case because he had presented before the Section on December 18, 1916, a modification of the fat implantation operation. He had shown before the Section in January, 1919, a boy, aged 9½ years, on whom he had performed the modified fat implantation five and one-half years before, and in which case the

fatty mass remained fully formed, filling the orbit, with very satisfactory motility and presenting a prothesis in similar position and sensitive motion as the fellow-eye. He had also shown a similar case before the Section in December, 1921, to illustrate the same satisfactory feature of this modification of the fat implantation operation. Four similar cases were also presented before the American Congress of Ophthalmology in 1918, when a symposium on "Enucleation and its Substitutes" was the subject of general discussion.

Dr. Key maintained that the fat implantation operation properly performed in suitable cases is the operation of choice.

DR. JULIUS WOLFF showed a case in which he had removed a cataract containing a foreign body.

Mr. T. McG., aged 32 years, on September 30, 1922, complained of moderate discomfort of the left eye, and had been told that he had iritis. Absolutely no history of injury of any kind.

Examination showed no evidence of former iritis; eye externally normal, no scar in cornea or elsewhere, pupil round and normal. Lens showed a cataract which had not yet involved the whole cortex but reduced vision to hand movements. In spite of lack of evidence or history of injury the patient was referred for X-ray and a pin point foreign body was located near the posterior surface of the lens in its upper nasal quadrant. On account of the small size of the foreign body and its doubtful nature, an attempt at magnet extraction might not succeed and would necessitate a second operation for its removal. If the lens were needled and washed out and an attempt made to remove the foreign body, the latter might become displaced and fail to be attracted by the magnet. He decided, therefore, to remove the lens together with foreign body. This was accomplished by making an incision a little smaller than usual for senile cataract and removed a large piece of the anterior capsule with the capsule forceps. He delivered the upper two-thirds of the lens unbroken and containing the foreign particle, a tiny iron splinter. Fifteen days after operation vision was $\frac{2}{8}$ with correction.

DISCUSSION: DR. J. M. WHEELER asked if the magnet had been applied, to which Dr. Wolff replied in the negative. Dr.

Wheeler stated that owing to the small size of the foreign body, it may not have responded to the magnet, and that the method of procedure in the case appeared to be an excellent one.

DR. W. E. LAMBERT referred to a case in which he had removed the lens containing a foreign body, without event, and the result excellent.

A case of **traumatic rupture of the choroid** by a shot from an air-gun was reported by DR. C. E. McDANNALD.

A boy was brought in by his father, who gave the history of the accident and presented in his hand the air-gun bullet which he stated had struck the eye. Examination showed the eye to be ruptured at the nasal portion of the globe, soft, and the anterior chamber partly obscured by blood. The fundus could not be made out. In spite of the clear history, Dr. McDannald insisted upon an X-ray, which revealed a bullet similar to that presented by the father. Dr. McDannald reported the case to emphasize the importance of X-ray regardless of the history.

DR. M. ROSENBAUM showed a case of **connective tissue mass of the optic nerve**.

Boy, M. T., aged 10 years, came to be fitted for glasses. His right eye appeared normal except for a high hyperopia of +12.00 diopters. The fundus of the left eye presented a white mass of connective tissue covering the optic nerve, square in shape, three disk diameters across and about the same vertically. From the center of the white mass a pear-shaped object extended ventrally into the vitreous for about three to four millimeters, the most anterior part having a grayish center. Vision could not be improved and a central scotoma corresponded to the lesion.

DISCUSSION: DR. E. KRUG thought the mass was cystic and probably on a pedicle, seemed curved on either side, certainly fibrous tissue and comes from the optic nerve.

DR. E. M. ALGER recalled seeing two cases very similar, but neither of them was as extensive in outline as the case presented.

DR. MARTIN COHEN thought it might be a case of filaria, similar to a case he had seen described. It appeared to be cystic, and deserved differentiation from echinococcus cyst, filaria and other possible cystic forms that may occur in the eye.

DR. C. E. McDANNALD had seen a similar mass in the eye of

a pregnant woman, which disappeared after termination of pregnancy.

DR. E. M. BLAKE suggested that the high hypermetropia seemed to indicate a congenital defect and perhaps therefore a persistent broad canal of Cloquet.

DR. B. W. KEY presented a case of **unilateral chorio-retinal atrophy**.

M. P., Italian man, aged 30 years, complained of repeated attacks of inflammation of the right eye over a period of fifteen years. Each attack clouded the vision temporarily, each time leaving the eye partly blinded, until now only fingers at two feet could be detected. Left eye normal and free of previous involvement. History and laboratory tests negative. Father of three healthy children.

Examination: Externally both eyes appeared normal. Fundus of right eye showed extensive atrophy of choroid and retina with peculiar pigment distribution, and peri-papillary changes. The left fundus was normal.

Two years afterwards, a violent scleritis, two large and two smaller nodules, developed in the right eye, with the fundus obscured by a dense hyalitis. This was evidently the character of the so-called previous inflammatory attacks of which he complained. The left eye was unaffected. All laboratory tests and other investigation did not disclose the ætiology. Mixed treatment intensive, with local treatment brought relief, and together with subsidence of the scleritis the vitreous became clear and transparent. The chorio-retinal atrophy appeared to be the result of an inflammation of the entire wall of the globe, perhaps affecting the choroid and retina by contiguity rather than directly.

The obscure ætiology, the character of the lesions, and the unilateral feature of selectivity were dwelt upon as being worthy of note.

DISCUSSION: DR. MARTIN COHEN suggested that glandular derangement may be the cause, also syphilis could not be ruled out.

DR. HOMER SMITH did not regard three healthy children of a parent as any reason for ruling out syphilis of the father, and cited a case in point. He suggested a tuberculin inoculation test.

DR. K. SCKLIVEK said the case was interesting as a case of contiguous inflammation of the choroid; that the atrophic vessels would indicate syphilis.

DR. WALDSTEIN regarded the highly sclerosed vessels as most significant of a previously recurring inflammation.

DR. I. GOLDSTEIN presented a **tonometer tester** (Schiötz). This consisted of eight artificial corneas, similar in shape and curve, as those that accompany the Schiötz tonometer. Through the center of each artificial cornea a hole has been drilled 3mm in diameter and 6mm in depth. The lower part of the opening has a thread in it. Into this thread a flat-headed screw has been screwed to the desired length, and then set. The artificial corneas are placed into individual openings of a flat piece of steel. For testing, the tonometer is placed in succession upon the different artificial corneas, reading from left to right upon the arc, and are arranged to register 0, 3, 5, 7, 10, 15, 17, and 20 respectively.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. H. DICKINSON, LONDON.

A meeting of the Section was held on Friday, January 12th, the President, Mr. A. L. WHITEHEAD, occupying the chair.

CASES.

Retinitis Pigmentosa sine Pigmento.

Mr. J. A. VALENTINE showed an instance of this condition in a man aged 26, who complained that his sight had been failing since 1915. Vision in the right eye was $\frac{5}{8}$, in the left $\frac{6}{12}$. There was 1 D. of hypermetropia on right and left sides. Ring scotomata were present. The pupillary reactions were normal, and the media clear. The disks showed pallor, and indistinct margins. In order to find his way about at night he had to look closely on the ground, probably due to the contraction of his central visual field.

THE PRESIDENT said that what struck him most about the case was the appearance of the disks. Choroidal changes round the periphery were marked; there was no tendency to the waxy appearance one was accustomed to see, even in the early stages of retinitis pigmentosa.

Amaurotic Family Idiocy.

Mr. A. LEVY showed a baby aged 19 months with this condition. The parents and grandparents were not Jewish, but pure English. The parents were related before marriage; first cousins. The child had a good deal of spastic paralysis,

had the characteristic cry, and had never learned to eat, nor to sit up by itself. The anterior fontanelle was widely open, and the patient had been wasting for some months.

Mr. TREACHER COLLINS reminded members that Sir Frederick Mott had pointed out that the ganglion cells of the whole body, even of the sympathetic system, were affected in this disease.

Maculo-Cerebral Degeneration.

Mr. MONTAGUE HINE brought forward two cases (in brothers) of maculo-cerebral degeneration. He saw the eldest boy three years ago, when he was 16 years of age. He commenced to have epileptic fits when he was 10 years old. These were treated. His vision was then found to be defective, but when he had been fitted with glasses it was still bad. The exhibitor then saw that his maculæ were very finely granular. Dr. Gordon Holmes agreed with the diagnosis of maculo-cerebral degeneration. There was no syphilis, nor consanguinity in the parents. To-day his mentality was seen to be very sluggish, and he had some paralysis, and incontinence of urine.

The patient's brother was brought for an opinion as to whether he had anything wrong with him. Vision was $\frac{1}{12}$ in each eye. Both his maculæ were finely granular. In October he started to have fits; they started at the same age as they had in his brother. The fits had continued at intervals since and this patient seemed to be going the same way as his elder brother just referred to.

Dr. RAYNER BATTEN agreed with the diagnosis, believing that the cases belonged to the juvenile class, not the infantile. In one class pigmentation occurred without cerebral symptoms.

Polycythæmia Rubra, with Visual Defect.

Mr. P. BARDSLEY showed a case of this condition in a young theological student, who was unable to concentrate more than four hours a day, and suffered also from physical fatigue. His red cells numbered 7,600,000 per c.m., and the color index was slightly diminished. During the three years he served in the Army his condition was normal, and he was

classed A1. A physician had told him that venesection to about 30 ozs. every few months was the only real treatment.

Case of Hole in the Hyaloid.

Mr. LINDSAY RAE showed a case of this condition. He said that when he first saw the patient, three years ago, the vitreous was opaque with opacities. Wassermann was strongly positive. After the syphilis had been treated, by injections followed by mercury and iodide of potassium, the vitreous bodies began to clear, and a ring was seen in front of the optic disk. Sir William Lister said he considered it a true case of hole in the hyaloid.

Mr. TREACHER COLLINS said there could be little doubt that in this case the vitreous was torn away from the optic disk, and where that happened there had been left the circular hole which had been described.

Mr. GILBLETT described two cases of the condition he had seen recently at the Ministry of Pensions; in each of those patients the hole was four times the diameter of that in Mr. Rae's case.

Neuro-retinitis with Detachment of Retina.

Mr. RAE also showed a patient with this condition, which had probably been started by a septic focus in the teeth, as that was the only abnormality which could be found. Vision had fallen to $\frac{1}{80}$, but to-day it was $\frac{6}{8}$, and no macular degeneration could be seen. She had been to the seaside for six months, and had had inunction of mercury ointment and the internal administration of iodide of potassium. Vision was, as stated, now $\frac{6}{8}$, and there was an improvement all round.

Mr. HARRISON BUTLER read a paper relating some curious operative results after the operation of cataract extraction.

The Treatment of Conical Cornea.

Mr CHARLES KILLICK (Bradford) read a paper on this subject. He said he believed that keratoconus was not often seen in its earlier stages, but in strenuous work slight cases could easily be overlooked. Where doubt existed there should be a more frequent use of Placido's disk. His own experience

of the condition had been when it presented a definite cone in each eye, when there was an opacity at the apex in one or both eyes, and when the vision was much reduced, usually below $\frac{6}{60}$, though it might be improved to $\frac{6}{24}$ by looking through a small aperture and by adding concave lenses. Sometimes unilateral cases were seen. One such developed suddenly in a lady, and did not vary over a period of several years. Death eventually was due to chronic tuberculosis.

Treatment was almost always a question of surgical interference. Women were by far the more frequent sufferers from it. Of his six last cases, five were in women, including two pairs of sisters and a mental defect. The male was well developed, and had never had good sight. He, and one of the females, had marked peripheral cataractous changes in both lenses. There seemed to be a tendency for it to occur in families. There had seldom been opportunities of microscopically examining eyes with keratoconus, but Parsons stated that Bowman's membrane was intact, but was thinned and wrinkled, Descemet's membrane being unchanged. Parsons gave the following main theories as to causation: Relative increase of intraocular tension; malnutrition of the cornea, or inherent weakness of it; defective embryological development; disease of Descemet's membrane and epithelium. Ulceration or rupture of the cone had not been observed. The cornea was much thinned, and might be reduced to one-third of the normal. The great difficulty was as to how to treat such an obstinate malady.

The late Mr. Charles Wray said that in the early stages much might be done by general treatment, but the treatment laid down by him seemed too rigorous for hospital patients, and required long rest for the eyes. In advanced cases, though general treatment could be added to the surgical, it could not be curative. The mental defect he did not attempt surgery on, and the young man declined it, therefore general treatment had to be carried out, and this resolved itself into the application of a firm pressure bandage and the administration of a tonic. This resulted in restoration of almost complete corneal transparency in a short time. He had seen the same result from it in other cases too. But it did nothing to bring about flattening.

The chief operative methods were cauterization of the cornea, with or without its perforation, combined, if necessary, with optical iridectomy and tattooing, cauterization combined with sclerectomy, excision of the apex of the cone, or by extraction of the lens. He had had only a limited experience of Critchett's target operation. Terrien said that cauterization without perforation had never yielded him good results. He, the author, quoted a case of his own in support of this, that of a nurse, whom he first saw in November, 1920. She was aged 24, and in good health, but her eyes had not been right for the past four years. Vision was bad, and she had well marked conical cornea in both eyes. He did first a sclerectomy in the right eye, to establish hypotony. It was followed by iritis, hypotony and a small macula on the cone apex, which soon disappeared as the eye recovered. The eye healed without leaving any obvious sign of fistulization, and the corneal condition was not altered, nor vision improved. She returned to work, but eight months later came back asking for a further operation, as she could not see to do her work efficiently. The right eye had less than $\frac{6}{80}$ vision, and the left with 7.00— $\frac{6}{85}$. He next tried the effect of performing the first stage of cataract extraction, making a large flap, in the hope that a pressure bandage and post-operative astigmatism might produce a beneficial result, but was again disappointed. Altogether six operations were performed, and later she was admitted to a sanatorium, with her sight very little better.

The following case, however, seemed to show that something better could be done. It was that of a married woman, æt. 49, who had conical cornea, but not so markedly as the last case. Her sight had been gradually failing for twelve years. She had never worn glasses. She had conical cornea in both eyes, with a small opacity on the apex of the right, and there were marked peripheral opacities in both lenses. Vision was less than $\frac{6}{80}$, and was not improved by glasses. General treatment was first tried, but a year later, as there was no improvement and on account of the lenticular opacities, he decided on simple extraction, by the method of the sub-conjunctival bridge; the width of this bridge should be about one-third of the total incision. A good recovery ensued, and she was discharged after 9 days with a fair amount of after-

cataract. Later she was re-admitted, for discission to be carried out, and he succeeded in making an incision in the capsule about 1mm broad, and $\frac{1}{2}$ cm long in the vertical diameter. He described the procedure in detail. Vision was found to be improved, and the patient left the hospital in September last with a quite transparent cornea, and was wearing -5.00 D. sphere, together with -1.00 cyl., axis horizontal, with which she could manage to read $\frac{6}{24}$.

Mr. ELMORE BREWERTON described the operation he had carried out in his last six cases of conical cornea, namely, making a crucial incision through the apex of the cone with a narrow Graefe knife, and two lateral incisions with scissors. The wound healed in two or three days, and there was a certain amount of flattening, the patient seeing over the center. One patient, a working girl, on whom he did this, had $\frac{6}{24}$ vision without glasses.

CLINICAL MEETING, FRIDAY, FEBRUARY 9, 1923.

A clinical meeting of the Section was held at the Royal London Ophthalmic Hospital ("Moorfields") on Friday afternoon, February 9th, under the Presidency of Mr. A. L. WHITEHEAD (Leeds), when a large number of cases were exhibited, and a good proportion of them discussed.

Optic Atrophy after Herpes Ophthalmicus.

Mr. LESLIE PATON showed an interesting example of this condition. The patient was a married woman, aged 67. Last Easter she had a bad attack of ophthalmic herpes, which affected all the branches of the first division of the 5th nerve on the left side. There were faint nebulae on the cornea which were left by corneal vesicles. On recovering from the herpes she found the vision of the left eye was lost. When first seen she could only perceive hand movements with that eye, and the field was evidently very limited. The left pupil did not react to direct stimulus, but did so to consensual stimulus. There was a slight reaction to concentrated light. With the ophthalmoscope an opaque white disk was seen, with fairly clean-cut edges. The lamina cribrosa could not be seen.

There was no evident disturbance of retinal pigment round the edges of the disk, but the vessels were of reduced caliber.

He said true optic neuritis as a complication of herpes ophthalmicus was a comparatively rare event. He had not seen a case with it until last summer, when Mr. Adams, of Oxford, sent him a patient, a lady aged 35, who had had shingles on the right side commencing on May 15th. The whole first division of her fifth nerve was affected. After the subsidence of the herpes in that eye it was found to be quite blind; the pupil was semi-dilated, and was not reacting to light. Her tension, when he saw her, was quite normal. The ophthalmoscope showed an absolutely atrophic disk, and he had yet to hear of even a slight recovery of vision in that eye.

He had found that quite a number of these cases had been published. In Sir Jonathan Hutchinson's classical account in the *Ophthalmic Hospital Reports*, Vol. v, 9, 191, that authority said that the globe of the eye was never affected except in cases where the naso-ciliary branch of the first division of the fifth was involved, but, though this was a good general guide to prognosis, it was not universally true. In the next volume of the same Reports was a description of a case by Bowman, but this, and some others, were probably not primary infective herpes, but herpes of a secondary nature. Mr. Paton gave a synopsis of a number of other cases.

Evidence of other cranial nerve involvements was much more frequently found. In last year's epidemic he had several cases of diplopia, also one case in which the 6th nerve was involved. Statistics showed that the 3rd nerve was much more frequently involved, there was also affection of the nerve supply to the iris and ciliary muscle in some. It was commoner, in this disease, to find a small than a semidilated pupil. In one very severe and generalized case of herpes now under his care the corneæ were, so far, quite free. Another case had well-marked deep keratitis with iridocyclitis, also cases with hypotony. The latter were mostly those in which the iris and ciliary body were involved in the congestion. Quite recently he saw a case in which the whole of the first division of the fifth and the whole of its second division were affected. The changes in the optic nerve seemed to be

secondary to the peripheral changes in the circulation produced as a result of the herpes.

In regard to any association there might be between this affection and chicken-pox, there was need of further information, but it was accumulating; he had several times been able to trace what appeared to be a causal relation.

Mr. PICKARD (Exeter) spoke of a very severe case of herpes ophthalmicus, resulting in complete blindness. He said it was commonly believed in Devonshire that there was a relationship between herpes and chicken-pox.

Mr. W. H. McMULLEN described a case of his own now under care in which optic atrophy had followed herpes. There were a few spots of keratitis punctata, probably fairly old, as much of the area was brown, and the disk somewhat pale; it was now white.

Case of Cicatrization of the Retina.

Mr. FRANK JULER showed this condition in a child who was sent from school for examination in the ordinary way because of defective vision, which was $\frac{3}{8}$ in the left eye. The ophthalmoscope revealed a half-circle of fibrous looking material involving the macular region. The tension was plus 2, and there were hemorrhages along the edge of this tissue. Six months previously the eye had been struck by a rubber ball, and the speaker thought the condition was due to trauma; there might have been rupture of the retina and the choroid beneath, and that the hemorrhage from the rupture had now become organized.

Bilateral Tubercle of Choroid in a Kitten.

Mr. J. B. LAWFORD and Mr. HUMPHRY NEAME showed specimens from a kitten which had tubercle of both choroids, with detachment of retina. The kitten had not wasted, nor refused food. It was chiefly fed from the household milk supply. The sight defect developed rapidly, and was known because the kitten walked into a sunken tub of water in the garden. The pupils were dilated and apparently motionless to light; testing by artificial light in a darkened room gave the

same result. The corneas were bright, and the lenses clear. After the kitten had been chloroformed out of life, the eyeballs were removed and placed in Zenker's fluid.

Mr. NEAME said he found that the posterior part of the choroid was definitely thickened. The retina was completely detached. There was a small focus of infiltration on one side of the ciliary body. The minute structure was granuloma, in which epithelioid cells predominated. He was unable to find tubercle bacilli in the section, a common experience especially in animals' eyes.

Band Keratitis.

Mr. A. C. HUDSON showed two cases with this condition. The question of interest was the results of operations. In one of the patients he operated by scraping away the film, and the result was very satisfactory, for whereas the sight had been less than $\frac{6}{60}$, it was now $\frac{6}{12}$. The film was not definitely calcareous, but no very definite decision had been come to about it in the laboratory. The vision of the other patient was not so bad as in the one operated upon, but he proposed to do something for her.

Mr. LESLIE PATON agreed as to the toleration of these patients for scraping; as also did Mr. AFFLECK GREEVES.

Atrophic Patches at the Macula, possibly Tuberculous.

Mr. WILLIAMSON-NOBLE showed a married woman, aged 36, who came to hospital giving a long history of operations in various parts of the body for tuberculous disease. Vision in both eyes was reduced to $\frac{6}{60}$, and in the right eye the internal limiting membrane could be seen to be pushed forward 3 D.

Cyst of Sclero-Corneal Margin.

Mr. KENDALL exhibited a boy aged 17, who came on account of feeling a foreign body in the eye, which he regarded as a blister. A cyst of the sclero-corneal margin was discovered. In the ordinary way it was covered by the lid. The boy had no recollection of having received an injury to the eye.

SIR WILLIAM LISTER commented on the similarity of this case to one of implantation cyst following an advancement. In some of these cases there had been an injury in childhood, which had passed as of little account, and that may have been the starting point of the trouble.

A numerous series of cases illustrating changes due to congenital defects and injuries were also examined.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by DRs. A. N. ALLING, New Haven; M. J. SCHOENBERG, New York; T. H. BUTLER, London; P. G. DOYNE, London, and K. WESSELY (*Archiv für Augenheilkunde*), Würzburg.

Edited by MATTHIAS LANCKTON FOSTER, M.D., F.A.C.S.,
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I.—THE EYE IN ITS RELATIONS TO GENERAL DISEASE AND POISONS.

1. ALGER, E. M. Three cases of word blindness. *American Journal of Ophthalmology*, October, 1921.
2. BELL, G. H. Relation of teeth, tonsils, and intestinal toxæmias to diseases of the eye. *Journal A.M.A.*, October, 1919.
3. BLAKE. Ocular changes in infantile scurvy. *American Journal of Ophthalmology*, October, 1921.
4. DOYNE, P. G. The scotomata of tobacco amblyopia. *British Journal of Ophthalmology*, January, 1922.
5. FOSTER, M. L. Ocular symptoms of epidemic encephalitis. *American Journal of Ophthalmology*, January, 1922.
6. GAUDISSERT, P. Hypercholesterinæmia and albuminuric retinitis. *Ibid.*, February, 1922.
7. HARMON, N. B. Causes and prevention of blindness. *Ibid.*, November, 1921.
8. ISCHREYT. The involvement of the eye in purpura hæmorrhagica and typhus. *Klin. Monatsbl. f. Augenheilkunde*, 1921, p. 211.
9. KEEGAN, J. J. Neighborhood signs in pituitary tumor. *American Journal of Ophthalmology*, November, 1921.
10. PATTERSON, J. A. Certain appearances observed in the eyeground of the tuberculous. *Ibid.*, January, 1922.
11. PINCUS. Treatment of methyl alcohol blindness by lumbar puncture. *Klin. Monatsbl. f. Augenheilkunde*, 1920, p. 695.
12. SCHLAEPFER. A case of three days' blindness after aspiratory puncture of the lungs. *Deutsche Zeitschrift f. Chirurgie*, 1920, p. 132.
13. SCHOEPPPE. Eye changes in Boeck's lupoid (so-called benign) upoid. *Klin. Monatsbl. f. Augenheilkunde*, 1920, p. 812.

ALGER (1, **Three cases of word blindness**) reports a case of hemiplegia and hemianopsia accompanied by inability to recognize familiar objects. It was with difficulty that the patient found his way about and he could not read. He could, however, write readily but in a few moments could not read what he had written. Two cases of congenital word blindness are also related. Both boys seemed normal except could not learn to read as normal children. Visual memories seem to be stored in the cortex about the angular gyrus on the left side in right-handed persons and the area is divided so that memory for letters, words, musical notes, different languages, etc., has local centers. It is important to recognize these cases that their education may be intelligently directed, for it is possible, in children, to develop the corresponding centers on the other side of the brain. ALLING.

HARMON'S (7, **Causes and prevention of blindness**) paper is largely statistical. He shows that the causes of blindness in infancy are few and therefore the percentages are large. Whereas it is known that 50% of the blindness of infancy is due to ophthalmia neonatorum, the figure for all ages is only 2.5% and for syphilis 9%. Among the preventable causes may be classed ophthalmia neonatorum, phlyctenular keratitis, syphilis, industrial accidents and, to a certain extent, myopia. Trachoma, as the cause of blindness, seems to be negligible in England. ALLING.

In SCHLAEPFER'S (12, **Three days blindness after aspiratory puncture of the lungs**) case the syringe was removed from the needle in order to empty the fluid, leaving the needle open in situ. The patient collapsed immediately, had clonic convulsions of the entire body and moderately dilated pupils which refused to respond to light. Consciousness returned in a few minutes, but the patient could not see. After the fourth day the vision began to return, but it was not fully restored until after six months. The appearance of the fundus was normal on the following day and also for three weeks. He ascribes the symptoms to an embolus of air.

No intelligent ophthalmologist of to-day fails to investigate these causes for eye lesions. BELL'S (2, **Relations of teeth, tonsils, and intestinal toxæmias to diseases of the eye**) paper is a plea for more thorough consideration of focal infections.

The teeth should be properly treated in childhood and future trouble thus avoided. Most tonsils are diseased and should be removed. He thinks that carbohydrates are the cause of gastric and intestinal fermentation and the diet should be as free as possible of sugar, against which he has a special grudge.

ALLING.

BLAKE (3, **Ocular changes in infantile scruvy**) calls attention to exophthalmos in this disease. It has been found in about 10% of the cases and is due to orbital hemorrhage either in the orbital tissue or beneath the periosteum. In the case reported the child recovered when placed upon the proper diet.

ALLING.

FOSTER (5, **Ocular symptoms of epidemic encephalitis**) records with great care the ocular signs which appeared in two of his patients. It is highly important that exact records should be kept, especially regarding the muscular involvements and the sequence of the appearance of the symptoms.

ALLING.

In ISCHREYT'S (8, **Involvement of the eye in purpura hæmorrhagicæ**) first case of purpura hæmorrhagica there were opacities at the posterior pole and little spots in the macula, together with little retinal hemorrhages in one eye. The skin of the lids was strongly pigmented. The second patient had only a small conjunctival hemorrhage, while the third had iritis. Ischreyt also reports a case of double metastatic ophthalmia observed in a case of typhus. The patient was suffering from metastatic abscesses in various parts of his body, and the second eye was attacked about the time that the first was enucleated.

With the introduction of scotometry into the routine of clinical examination it has become necessary to establish and to differentiate various forms of scotomata which are associated with various pathological conditions. In this paper DOYNE (4, **The scotomata of tobacco amblyopia**) is dealing with the scotomata of tobacco amblyopia in this connection. In the first place he states that the tobacco scotomata are situated in the zone between the macula and the blind spot, whereas the early glaucoma scotomata are not usually found in this situation, but rather along the arc of the 10 circle around the fixation point.

With regard to the tobacco scotomata in more detail, he finds that there are 3 types of absolute scotomata:—

(1) A large scotoma involving the blind spot and the area between the blind spot and fixation, but which just stops short of the actual fixation point.

(2) A scotoma lying close to fixation within the 5 circle, connected by a relative area to the blind spot, which may or may not be prolonged towards fixation.

(3) A scotomatous finger pointing from the blind spot towards fixation. These scotomata are absolute scotomata, and associated with them there is relative loss over a larger area. Doyne states the only reliable way of estimating the size of a relative scotomatous area is to reduce the size of the test object, so that the relative area of a large test object becomes the absolute area of the small test object.

With regard to colors, blue conformed with white and red with green.

The red-green absolute loss was much larger than the white-blue loss and usually involved the fixation point, but conformed in shape. Thus, in mild tobacco cases, a red-green scotomatous finger extending from the blind spot towards fixation might be found, when no white-blue scotoma was demonstrable.

A further point touched on in this paper is the phenomenon of successive induction or after images in these cases of tobacco amblyopia. Usually in a well-marked case the after image of red or of green was not obtained, whereas the yellow after image of blue was readily produced.

PINCUS (11, **Treatment of methyl alcohol blindness by lumbar puncture**) reports three cases in which he has tried this method, and says that in all a single lumbar puncture sufficed to secure a restoration of vision to a considerable degree.

Since 1910 several cases of benign miliary lupoid associated with iritis or iridocyclitis have been observed. SCHOEPPÉ (13, **Eye changes in Boeck's lupoid**) adds another. In addition to the skin the glands and lungs were affected and there were nodules in the conjunctiva, the lids, the tarsus, and the iris, together with cataract, posterior synechiæ, and reduced tension. Wassermann was negative. In the course of time the cutaneous trouble disappeared, but there was no improvement in the condition of the eyes, which underwent phthisis bulbi.

On account of the possibility of such bad complications as were present in this case, the writer believes that the otherwise relative benignity of the disease should not be emphasized in its name.

KEEGAN'S (9, **Neighborhood signs in pituitary tumor**) paper dwells especially on the signs of pituitary tumors, which appear as the result of pressure on the chiasm and the optic nerves. It has been well established that the early extension of these growths is, in the majority of cases, forward in front of the chiasm and that the first ocular signs are contraction of the upper temporal quadrant due to the pressure on the under surface of the chiasm. Further extension forward will result in a more complete temporal hemianopsia and later complete blindness. Other signs are ocular paralysis, anosmia, and exophthalmos due to involvement of the cavernous sinus.

ALLING.

PATTERSON (10, **Certain appearances observed in the eye-ground of the tuberculous**) has observed anomalous distribution, multiplication, and tortuosity of the retinal veins and at times of the arteries as well, in tuberculous patients as in those in whose family history tuberculosis is to be found. He offers no explanation for these abnormalities.

ALLING.

The theory that cholesterin in the blood which is deposited in the tissues is responsible for such lesions as xanthelasma, synchysis scintillans, and gerontoxon has been advocated. GAUDISSERT (6, **Hypercholesterinæmia and albuminuric retinitis**) instituted a series of experiments to prove the truth of the supposition that cholesterin in excess in the blood produces lipid deposits in retinitis albuminuria and gives rise to the white spots. He concludes that there is no connection between the two conditions because one half of his cases did not show hypercholesterinæmia and those that did have had also uræmia, high blood pressure, and a number with excess cholesterin did not have retinitis.

II. OCULAR DISEASES, PATHOLOGY, AND REMEDIES.

14. BLATT. Parenteral injections of milk in trachoma. *Klin. Monatsbl. f. Augenheilkunde*, November, 1920, p. 668.

15. BRAUNSCHWEIG. An aid for hemianopsics. *Ibid.*, October, 1920, p. 535.

16. BULSON, A. E. Butyn, a new synthetic local anesthetic; Report concerning clinical use. *American Journal of Ophthalmology*, January, 1922.
17. FUCHS, A. Derivates of the plasma cells in the eye. *Archiv f. Ophthalmologie*, ciii., p. 228.
18. HESS. The practically most important tuberculous diseases of the eye. *Münch. med. Wochenschrift*, 1920, p. 1325.
19. JENDRALSKY. Radiotherapeutic irradiation of tumors and tuberculosis of the eye and its surroundings. *Klin. Monatsbl. f. Augenh.*, January, 1920, p. 96.
20. LAUBER. Treatment of exudative eye diseases with intravenous injections of sugar. *Wiener klin. Wochenschrift*, 1920, p. 35.
21. SCHWARTE. Treatment of severe infectious diseases of the eye with injections of milk. *Klin. Monatsbl. f. Augenheilk.*, November, 1920, p. 678.
22. SIDLER-HUGUENIN. Eye syphilis in the second generation. *Ibid.*, January, 1921, p. 44.

HESS (18, Tuberculous diseases of the eye) insists that the tuberculous nature of phlyctenulæ is shown by the fact that 95% of the cases present other signs of scrofulosis. He energetically combats treatment of these diseases in the dark, and especially under a bandage. Exposure to the short waved light of the sun has proved beneficial. He sees no advantage to be obtained from the use of calomel, and thinks that the yellow oxide of mercury ointment acts rather as a soothing salve, rather than through any special action of the mercury. Under tuberculous diseases of the uvea attention is called to the frequency with which tuberculous iritis runs its course very inconspicuously, so that it may be easily overlooked, or at least its ætiology not clearly determined.

FUCHS (17, Derivates of the plasma cells in the eye) has investigated the eosinophile cells frequently observed by E. Fuchs in iridocyclitis, and describes their form, staining, and occurrence in normal and inflamed tissues of the eye. They show considerable variations in shape, granulation, and staining, but he includes them all under the name plasmacytoid cells and believes them to be partly ripe, partly degenerative forms of plasma cells. They are usually oval or round, but often adapt themselves in form to the surrounding tissue. The nucleus is never lobed, but is roundish oval and has a varying content of chromatin. Its most marked characteristic is a dense granulation of its protoplasm which is accustomed to take bright red

stain in hæmalaun-eosin. But they cannot be called true eosinophile cells because they are strongly basophile with the Giemsa stain. With polychrome methyl blue, or with alcoholic or aqueous solutions of thionin, the granules usually take a red violet stain. They are not colored by acid toluidin blue. In the normal eye they occur most often in the episcleral and subconjunctival tissue. They were very frequent in nine out of thirty cases of severe inflammation, yet they never appeared in intraocular exudates, where plasma cells are accustomed to be very numerous.

SIDLER-HUGUENIN (22, **Eye syphilis in the second generation**) investigated fifty-seven children born of parents who had formerly consulted him on account of eye diseases due to hereditary syphilis, and found only one that showed a positive blood Wassermann. The X-ray revealed no signs of hereditary syphilis in the bones of any. Twelve wives of husbands with hereditary syphilis gave negative Wassermans, which speaks against the transmissibility of the diseases to the wife. These facts go to show that syphilitic symptoms are not likely to appear in the second generation.

SCHWARTE (21, **Treatment of severe infectious diseases of the eye with injections of milk**) comes to the same conclusion as most observers, that in not a few cases of serious infective processes, such as purulent infiltration of the cornea, infected perforating wounds, and diphtheria of the conjunctiva, marked improvement in the objective condition, and a marked amelioration of the subjective troubles, can be obtained within six to eight hours after the injection, an improvement which could not be expected from other forms of treatment. No benefit was obtained in *ulcus serpens*.

BLATT (14, **Parenteral injections of milk in trachoma**) obtained no benefit from this method of treatment in trachoma.

BRAUNSCHWEIG (15, **An aid for hemianopsics**) places prisms before the eyes with their bases toward the hemianopic side and so obviates to a certain extent the tiring constant turning of the head or the eyes toward the affected side, by displacing the portion of the field in which vision persists across the middle line. Because of the weight of the lenses, the dispersion of the colored rays, and other optical effects, it is not practicable to use prisms stronger than 8°.

JENDRALSKY (19, **Radiotherapeutics of tumors and tuberculous diseases of the eye**) obtained no satisfactory result from irradiation of seven cases of sarcoma of the lids and orbit after thorough operative removal of the growths. With regard to the treatment of carcinoma, his eleven cases showed that superficial tumors may be cured by irradiation without operative intervention, while the deep tumors, involving the cartilage of the lids and the bones, a cure cannot be counted upon with certainty, even after thorough operative removal and subsequent irradiation. When the tumors are not quite superficial they should unquestionably be operated on and the irradiation begun very early. On the other hand inoperable cases may have their subjective troubles much alleviated by irradiation. In spite of the uncertainty of the result, irradiation may be the last resource, when an operation cannot be undertaken without destroying the only eye which has vision.

LAUBER (20, **Treatment of exudative eye diseases with intravenous injections of sugar**) obtained a good result in accelerating the absorption of an intraocular exudate in iridocyclitis and an oedema of the retina in a nephritic neuroretinitis by the intravenous injection of 4ccm. of a twenty-five per cent. solution of sugar. The addition of a hypertonic solution of sugar caused no fever and no unpleasant general symptoms. Glycosuria and serious arteriosclerosis are contraindications.

BULSON (16, **Butyn**) records the conclusions drawn from extensive trial of this new drug. It is more powerful than cocaine and acts more rapidly. Its effects are more prolonged and it is less toxic. There is no drying of the cornea, no change in the pupil, and no ischæmic effects. It can be boiled without impairing its efficiency.

III. ANATOMY, PHYSIOLOGY, AND MALFORMATIONS.

23. GRADLE, H. S. **The blind spot.** *Journal A.M.A.*, November 5, 1921.
24. HAGEN. **Secretion of the intraocular fluid in the human eye.** *Klin. Monatsbl. f. Augenheilkunde*, November, 1920.
25. KRAEMER. **Bilateral symmetrical optico-ciliary veins with extension into the choroid.** *Ibid.*, 1920, p. 579.
26. LÖWENSTEIN. **Origin of congenital opacities of the lens.** *Archiv f. Ophthalmologie*, ciii., p. 37.
27. NOVAK. **Malformations.** *Wiener Ophthalm. Ges.*, June 21, 1920.

28. POST, L. Quantitative determination of cocaine and atropine absorption by aqueous humor. *Journal A.M.A.*, October 22, 1921.

29. SEEFELDER. Hydrophthalmos as a consequence of a developmental anomaly of the angle of the anterior chamber. *Arch. f. Ophth.*, ciii., p. 1.

30. SIEMENS. *Ætiology of ectopia lentis et pupillæ*. *Ibid.*, ciii., p. 59.

GRADLE (23, **The blind spot**) shows that the blind spot is enlarged in cases of medullated nerve fibers adjacent to the disk, but the enlargement does not correspond in extent to the medullated area as seen by the ophthalmoscope. He explains this on the assumption that the medullary sheath is not opaque to the extent indicated by the ophthalmoscope appearance. The term opaque nerve fibers is a misnomer, the proper term being medullated nerve fibers. ALLING.

KRAEMER (25, **Bilateral symmetrical optico-ciliary veins**) found in a 4-year old boy with oxycephalus, pale papillæ, and bad vision which could not be measured accurately, within the papilla of each eye a branch of the inferior vein which lost the character of a retinal vein near the margin and suddenly assumed the appearance of a choroidal vessel, and could be followed in the choroid for three papillary diameters, going to the right in one eye, to the left in the other.

IN SEEFELDER'S (29, **Hydrophthalmos due to a developmental anomaly**) case there was a considerable enlargement of the anterior segment of the globe, especially of the cornea, with lacerations of Descemet's membrane. A circular peripheral synechia of the root of the iris totally occluded the angle of the anterior chamber. Schlemm's canal was situated far from the open chamber except in the region of a coloboma which was present in the iris. Other anomalies found were an abnormal length of the scleral framework, development of smooth muscle tissue in quite abnormal places, and faulty pigmentation of the posterior pigment layer of the iris. With the exception of the coloboma, the iris was normal.

SIEMENS (30, **Ætiology of ectopia lentis et pupillæ**) observed a family of ten brothers and sisters, of whom four sisters and one brother had ectopia lentis et pupillæ. From his study of the heredity in this family he concludes that most probably this is a recessive hereditary disease, which is particularly in-

dicated by the frequency of the anomaly among the children while the parents were not affected.

LÖWENSTEIN (26, **Congenital opacities of the lens**) describes two cases of congenital perinuclear opacities of the lens, shaped like a sagittal spindle. In both cases at the head of the spindle, beneath the apparently intact capsule, were dark brown hair lines arranged in a radiating manner, which resembled obliterated blood vessels. He thinks these were connected with the pupillary membrane, of which distinct traces were present in one case, and suggests the possibility that, perhaps in consequence of inflammation, the pupillary membrane penetrated the lens through the capsule.

NOVAK (27, **Malformations**) reports the case of a 10-year old boy who had slight exophthalmos on both sides, ptosis, and lipodermoids as large as peas somewhat encroaching on the cornea on the temporal side in the right eye, on the nasal in the left. Above on each side beneath the conjunctiva were large, lobed, soft tumors of reddish yellow color extending from the outer canthus deep into the orbit. On each side the pupil was ectopic upward with ectropion of the pigment layer. The papillæ were distorted, the course of the blood vessels in the fundus was abnormal, and there was an atrophic spot in the choroid of each eye.

HAGEN (24, **Secretion of the intraocular fluid in the human eye**) says that the human ciliary body can secrete only a fluid poor in albumin and not containing fibrin, while the ciliary body of the rabbit permits the transudation of a fluid rich in albumin and containing fibrin. After removing the aqueous five times from a healthy human eye he has been able to detect by means of the refractometer not the slightest increase in the albumin contained in the aqueous.

POST (28, **Quantitative determination of cocaine and atropine absorption by the aqueous**) withdrew the aqueous of the rabbit's eyes after instillation and subconjunctival injections of cocaine and atropine and estimated the amount of the drugs recovered. He concluded there is little difference in the percentage absorption of cocaine in any strength, that the two methods caused about the same absorption and that, in general, the best method for absorption is by repeated instillation.

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IV. THE SENSE OF SIGHT.

31. FRÖHLICH, F. W. Studies of periodic after images. *Zeitschrift f. Sinnesphysiol.*, lii., p. 60.
32. FRÖHLICH, F. W. Oscillations in the visual field. *Ibid.*, lii., p. 52.
33. FRÖHLICH, F. W. Studies of scintillating scotoma in the visual field. *Niederrhein. ges. f. Natur. u. Heilkunde*, January 17, 1921.
34. JUHASZ. Complementary colored after images. *Zeitschr. f. Sinnesphysiol.*, li., p. 233.
35. MENDEL. Intermittent blindness. *Neurolog. Zentralbl.*, 1920, p. 503.
36. MÜNZER. Bilateral hysterical amaurosis. *Berl. klin. Wochenschrift*, 1920, p. 1094.
37. SCHANZ. Ultraviolet content of light. *Arch. f. Ophth.* ciii., p. 158.
38. SCHWARZ. Bilateral and monolateral blindness; hysterical hallucinations. *Med. Klinik*, 1920, p. 1252.

FRÖHLICH (31, Studies of periodic after images) demonstrated with his apparatus four dark phases during which the sensitiveness to light is reduced in places in the visual field, and suspects that analogous periodic depressions of sensibility may be answerable for the periodic fading of weakly illuminated objects which hitherto has been ascribed to a deception of the senses brought about by changes in the accommodation, or fluctuations in the attention. He thinks that the physiological processes on which periodic after images are based are very closely connected with the processes in the nervous system which underlie periodic reflexes, and that the periodic after image is a periodic specific reflex. It is also said that the periodicity of the after images can be caused only by processes in the central nervous system, for there is no ground upon which to base the idea that it originates in the retina.

FRÖHLICH (32, 33, Scintillating scotoma in the visual field) observed on himself the beginnings of a scintillating scotoma and studied the periodicity of the oscillations by means of the same apparatus with which he studied after images. These oscillations differed from the periodic after images in their greater and uniform frequency. The scintillations correspond to the nervous tremor, the frequency being twenty to the second. The duration and strength of the scintillations depended upon the duration and strength of the light stimulus. When the light was of strong intensity and prolonged, or re-

peated several times, the scintillations lasted several seconds, but when the light stimulus was weak they were limited to one or more of the positive after image phases. When the light stimulus was colored the oscillations during the phase of the complementary colored after image had the same complementary color.

JUHASZ (34, **Complementary colored after images**) finds that the time of latency, after which the after image appears, is independent, at least within certain limits of light strength, of the intensity of the original figure, while the distinctness and duration of the after image is dependent upon it. An object on a black background induces a shorter time of latency and a longer duration of the after image than one on a white background. White light therefore accelerates the process which underlies the complementary after image. A corollary of this is that if the brightness of the colorless field against which the after image is observed is changed by the addition of white, the time of latency will be shortened and the after image prolonged, and this the more the whiter the field is made. If the background is darkened, the reverse takes place.

MENDEL (35, **Intermittent blindness**) reports a case of intermittent blindness following a blow on the left temple of a 13-year-old boy. At first vision decreased within five minutes to total blindness, to return within half an hour. Such attacks of blindness were repeated without apparent cause from one to three times a week. Objective examination showed nothing pathological, and there were no signs of hysteria. He believes that the trauma did not cause a direct injury to the brain cortex, but induced a slight condition of exhaustion at this place.

MÜNZER (36, **Bilateral hysterical amaurosis**) reports a case of this nature met with in a soldier 22 years old who, after having been gassed, suffered from conjunctivitis and blepharospasm. After two and a half years in hospital the man entered the school for the war blind. The eyes were kept tightly closed, the upper lids tremulous, and there was hyperalgesia and hypoalgesia in the region of the first branch of the trigeminus. The condition of the eye itself was normal, but the vision was only perception of light. Suggestion, along with strychnine injections, galvanization of the temples and other electrical treatment, effected a restoration of normal vision.

SCHWARZ (38, **Bilateral and monolateral blindness**) reports three cases of typical disturbances of vision, one of bilateral blindness, one of monolateral blindness, and one of hysterical hallucinations in a 10-year-old boy whose vision was good. In the treatment of such conditions as these the main point is to inspire the patients with the belief that the therapeutic measures employed will prove curative. The electric current is very useful for this purpose; strong currents are unnecessary. In obstinate cases hypnosis is of decided advantage. According to Schwarz hysteria is a pure neurodynamic loss of balance between different functional areas of the central nervous system.

SCHANZ (37, **Ultraviolet content of light**) presents the following propositions. 1. The ultrared rays act upon the molecule, increasing the vibrations and raising the temperature, but cannot penetrate the molecule itself; they do not produce chemical changes. 2. The visible rays act chemically upon living substance when they are absorbed through a coloring matter in the cell. 3. The ultraviolet rays of from 400 to 300mm act chemically directly upon living substance and can enter the molecule without the intervention of a sensibilizer. 4. Ultraviolet rays from 300mm downward likewise enter the molecule and exert a destructive influence upon living tissue, destroying the structure.

V. REFRACTION AND ACCOMMODATION.

39. COMBERG. **Relative binocular correction.** *Arch. f. Augenh.*, lxxxvii., p. 75.

40. ERGELLET. **The effort of accommodation in wearers of glasses.** *Zeitschr. f. ophthalm. Optik*, xix., 6, p. 761.

41. JUNIUS. **The problems of heredity and acquirement of myopia.** *Zeitschrift f. Augenheilkunde*, xlv., p. 262.

42. LEVINSOHN. **Genesis of myopia.** *Berl. ophthalm. Ges.*, October 28, 1920.

With regard to the correction of anisometropia COMBERG (39, **Relative binocular correction**) maintains that in many cases it is necessary that the refraction of both eyes should be accurately corrected, particularly to secure a finer sense of depth.

ERGELLET (40, **The Effort of accommodation in wearers of**

glasses) maintains that the accommodative effort of persons who wear glasses does not correspond to the really needed accommodation, and that from this point of view an eye corrected by a glass is not exactly emmetropic. He shows by figures that the accommodative effort of a myope corrected by a concave glass is distinctly greater, and that of a hypermetrope wearing a convex lens distinctly less than that of an emmetrope.

JUNIUS (41, **The Problems of heredity and acquirement of myopia**) says that neither the theory of the origin of myopia from strenuous near work, nor that of growth under muscular pressure in a special form or orbit, nor that of heredity can be considered satisfactory, though all of them contain much of value. Recently the idea has been expressed that the presence of preëxisting tissue changes must be assumed, which are difficult to differentiate from the secondary changes in the eyeball. But heredity alone does not explain the myopic process. Short-sighted eyes show together with the disturbance of the light sense the well-known thinning of the posterior segment of the sclera, which might be the first recognizable acquired change in the eye based on a hereditary peculiarity. Hereditary and acquired characteristics are always intertwined in myopia. There is no conclusive explanation of the origin of the conus, staphyloma, or of the myopic detachment of the retina. Much goes to show that myopia, with a predisposition in the structure of the eye which is not directly abnormal, is acquired in the true sense of the word, and may, therefore, differ individually. This is of importance for the understanding of individual forms of myopia. The myopic changes thus individually acquired have a hereditary basis. The most recent developments in biology are not opposed to this assumption, which is of fundamental importance. One factor still remains to be mentioned among those that tower above the hereditary factor, the part played by light. The luminous rays may possibly be specially harmful to the cones, while the ultraviolet rays may affect the rods, important in hemeralopia. At any rate it must be remembered that light has a far-reaching sensibilizing effect upon the cells and albumin. The influence of light is not yet susceptible of proof, but an assumption that light has an influence can scarcely be called an untenable hypothesis.

LEVINSOHN (42, **Genesis of myopia**) considers the explanation that myopia is due to a stretching of the eye by the intraocular pressure to be untenable, because a stretching from this cause would take place at the place of least resistance. Such a place would be the anterior segment of the globe in children, the lamina cribrosa in adults. He believes that myopia is caused by the bending forward of the head and body during near work so that the eye falls forward and during convergence pulls upon the optic nerve, which induces a stretching of the posterior segment of the eye. The influence of heredity is not contested.

VI. THE MOTOR APPARATUS OF THE EYE.

43. BIELSCHOWSKY. **Hysterical and functional disturbances of the eye movements.** *Zentralbl. f. d. ges Ophthalm.*, iv., 4.

44. DUANE, A. **The action of the obliques and the bearing of head-tilting in the diagnosis of paralysis.** *Transactions of the American Ophthalmological Society*, 1921.

45. HAATHI AND VUORINEN. **Winking.** *Skandinav. Arch. f. Physiol.*, xxxviii., p. 68.

46. POPPER. **Nystagmus of the lid and incomplete ptosis.** *Zeitschr. f. d. ges Neurol u. Physiol.*, xxxviii., p. 49.

47. SCHWARTZ, F. O. **Tenotomy and looping for the surgical correction of strabismus.** *American Journal of Ophthalmology*, November, 1921.

DUANE (44, **Action of the obliques and the bearing of head-tilting in the diagnosis of paralysis**) maintains that the principal function of the superior and inferior oblique muscles is not torsion but to respectively depress and elevate the eyes and that the inferior and superior recti act in the same manner. Hence it follows that the right eye is turned into the upper right quadrant by the superior rectus and external rectus, the left eye by the inferior oblique and internal rectus with some torsion according to Listing's Law. He says that the conclusion of some authors that a diplopia which is corrected by head-tilting is always due to oblique paralysis is not warranted but that the only real evidence of such paralysis is afforded by development of a marked and increasing deviation of the affected eye in adduction.

HAATHI and VUORINEN (45, **Winking**) find that the frequency of winking varies a great deal, from five to forty

times a minute in normal persons in whom no special influence can be perceived. The variations to be found in one and the same individual are very marked, but within much more narrow limits. Of the factors which demonstrably influence the frequency of winking there may be named such physico-physiological influences acting through the trigeminus and optic nerve as moisture, temperature, currents of air, light, and position of the eye. Psycho-physical influences may increase or decrease the frequency or alter the rhythm; thus close attention causes winking to be less frequent.

According to POPPER (46, **Nystagmus of the lid and incomplete ptosis**) nystagmus-like twitchings of the upper lid may accompany typical ocular nystagmus. He locates the probable site of the cause in the nuclear region of the ocular muscles. Nystagmus of the lid is absent, as a rule, in vestibular nystagmus. The cause may be a diffusion of the stimulation into the nucleus of the levator. The basis for these speculations is an observation made by Popper on a case of multiple sclerosis which presented a right-sided ptosis and a nystagmus that was particularly marked on looking to the left. On looking to the right the ocular nystagmus was present only at times, its place being taken by twitchings of the paralytic lid, while on looking to the left the ocular nystagmus was accompanied by these nystagmic twitchings of the lid which were more distinct in the paralytic lid.

BIELSCHOWSKY (43, **Hysterical and functional disturbances of the eye movements**) divides these disturbances into three groups, the spastic, the paralytic, and the anomalies, which are neither spastic nor paralytic in character. Hysterical nystagmus presents the following characteristics: 1. Neuropathic predisposition. 2. Nystagmus is almost always combined with spasms of the lid, convergence, accommodation, and pupils. 3. The nystagmus is extraordinarily rapid. There is no theoretical doubt concerning its occurrence in hysteria, as it can be produced voluntarily by many persons and can be learned. Paretic symptoms affect only convergence and divergence, hence diplopia is not produced. There are fundamental doubts as to the occurrence of pareses of single eye muscles. A monolateral ptosis can occasionally be produced voluntarily and is therefore possible. It is also known that a

monolateral paresis of the abducens may be simulated to a superficial observation by a combination of a lateral movement of both eyes and convergence. Bielschowsky therefore takes the ground that he cannot recognize a dissociation of eye movements as a hysterical symptom. Finally he describes faults of the fusion mechanism which are not always easy to distinguish from hysterical symptoms in consequence of faulty will impulse. If the fusion apparatus is defective a heterophoria may become manifest through lack of innervation and result in diplopia.

SCHWARTZ (47, **Tenotomy and looping for the surgical correction of strabismus**) describes his operation for advancement as follows: After tenotomy of the opposing muscle the one to be shortened is exposed and split in the middle for a length corresponding to the effect desired. Each half is then pulled away vertically forming a diamond shaped opening. Sutures are then passed horizontally through the conjunctiva and muscle near the extremities of the incision thus drawing the diamond into a vertical line and producing a corresponding shortening of the muscle. Before inserting the sutures and after their final exit through the conjunctiva they are passed through thin perforated gold plates to prevent them pulling through.

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VII. THE LIDS AND LACRIMAL PASSAGES.

48. COWPER, H. W. Meibomian seborrhea. *American Journal of Ophthalmology*, January, 1922.

49. FRIEDE. A case of pityriasis lichenoides chronica of the lid and conjunctiva. *Zeitschrift f. Augenheilkunde*, xiv., p. 253.

50. JENDRALSKI. Radiotherapeutic experiences with tumors and tuberculosis of the eye and its neighborhood. *Klin. Monatsbl. f. Augenh.*, lxvi., p. 96.

51. KÖLLNER. Operation for senile ectropion. *Zeitschr. f. Augenh.*, xlv., p. 14.

52. LÖWENSTEIN. Cartilage of the ear to stiffen the upper lid after excision of the tarsus. *Klin. Monatsbl. f. Augenheilkunde*, lxvi., p. 115.

53. SCHNYDER. Familial occurrence or heredity of diseases of the lacrimal passages. *Zeitschr. f. Augenheilk.*, xlv., p. 257.

54. SCHWARTZKOPF. A case of symmetrical tumor formation in all four lids (plasmone) with pathological findings. *Ibid.*, xlv., p. 142.

FRIEDE (49, **Pityriasis lichenoides chronica of the lid and conjunctiva**) reports a case in which the efflorescences appeared

elsewhere on the body and also on the lids, but not involving the margins and ciliary regions. The conjunctiva tarsi and fornix showed a uniform dense injection. Later in a recurrence the lid again showed the typical changes in the skin, again leaving the region of the cilia and the edge of the lid free, while in the conjunctiva of the tarsus and of the fornix only a uniform dilatation of the conjunctival vessels with no papilla formation could be made out with the loupe. The onset and disappearance of the conjunctival symptoms along with the exanthem, and its resistance to medicamental treatment, cause the author to think the trouble to be an endogenous infection.

JENDRALSKI (50, **Radiotherapeutic experiences with tumors and tuberculosis of the eye**) is not pleased with the results obtained by irradiation of sarcomata of the lids and orbit. In only one did he obtain a good result, in all the others even intensive irradiation failed to arrest the progress of the growths. Both X-rays and radioactive substances were employed. Two out of eleven cases of carcinoma were pronounced cured; in part of the others the growth was brought to a standstill, or broke down in suppuration. Only very superficial carcinomata of the lid can be cured. Postoperative irradiations should be begun early.

Abnormal secretions of the Meibomian glands are described by COWPER (48, **Meibomian seborrhea**) as thick like cream cheese, thin like oil, and a combination of these which resembles a thin pus. He relates a case in which a grayish white fatty secretion was poured out from the Meibomian glands in sufficient quantity to obscure the vision but accompanied by no inflammatory signs in the lid or conjunctiva. A bacteriological examination showed only the B. xerosis. Treatment gives but temporary relief.

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KÖLLNER (51, **Operation for senile ectropion**) modifies the excision of a wedge shaped piece of the tarsus and conjunctiva in the following way. The first incision is made not in the intermarginal space, but in the skin of the lid just below the cilia, running parallel to the edge of the lid for a distance of five to ten millimeters. At the ends of this incision the intermarginal portion is cut through vertically and the wedge of

tarsus and conjunctiva is excised along with the margin of the lid. The gap is then closed, the intermarginal edge being first accurately approximated and the two sutures introduced joining the edges of tarsus and conjunctiva. To remove the redundant fold of skin the first incision is continued laterally about a centimeter, curving somewhat downward, a triangular piece of skin is excised, the intervening skin is undermined, and the margins of this wound brought together and sutured.

The absence of a firm support in the upper lid after excision of the tarsus in trachoma sometimes results in unpleasant conditions. To obviate these LOWENSTEIN (52, **Cartilage of the ear to stiffen the upper lid after excision of the tarsus**) implants a piece of the helix about 12mm long by 6mm broad with its convex surface outward. This piece of helix is inserted between the two layers of the split upper lid, and is not sutured but is held in place only by skin sutures and a bandage. He describes a case in which this operation gave some benefit.

SCHWARTZKOPF (54, **Symmetrical tumor formation in all four lids**) reports the case of a boy 14 years old who had a swelling of the lids that had increased slowly for seven years. He complained of the weight of the lids and a sensation of pressure, but of no pain. There was bilateral ptosis, the lids swollen like air cushions. Palpation showed a firm tissue over which the skin was freely movable. The swelling was greatest in the transition folds. The plica was much enlarged, reaching almost to the lid margin. Diagnosis: amyloid of the conjunctiva. The tumors were partially removed; recovery took a normal course. Microscopically no amyloid could be found; apparently it was only a tissue infiltrated with small cells. All parts of the tissue showed about the same findings. The epithelium was for the most part normal, but in places much thickened. Sharply differentiated beneath it lay a dense accumulation of lymphoid cells, which seemed to consist almost wholly of nuclei that stained strongly with hæmatoxylin. This layer was from 2 to 4mm thick. The reticulum could scarcely be seen. These were plasma cells. Together with these cells were others like lymphocytes, which the writer considered to be products of the plasma cells. Finely granular cells were scarce, leucocytes nowhere found, and there were no foci of degeneration. There were few vessels, mainly arteries with

well developed muscularis and adventitia, the arterial walls in places undergoing hyaline degeneration. The writer cannot subscribe to Rund's idea of a genetic connection between the connective tissue of the vessels and plasma cells. Section of the left lower lid showed microscopically large roundish cells beneath the epithelium (hyaline form of degeneration of the plasmocytes), cell nuclei mostly marginal, and much plasma with vacuoles. The increase of hyaline degeneration was distinctly demonstrable. Russel's little bodies were marked. The vessels were not increased and were incased in large masses of hyalin. The constituents of the blood were of normal number and form, with an increase of lymphocytes. The benign nature of plasmonia is confirmed by the further history of this case.

SCHNYDER (53, **Familial occurrence of lacrimal diseases**) gives two family histories which show heredity of diseases of the lacrimal organs. In three females of one family the onset of the trouble appeared at almost exactly the same age, in the youngest on only one side. Several generations were affected.

(To be continued.)

BOOK REVIEWS.

II.—**Text-Book of Ophthalmology.** By Professor E. FUCHS, Vienna. Translated from the XII German edition, revised and enlarged by Dr. ALEXANDER DUANE, New York, VII edition, 997 pages, 445 illustrations. Philadelphia and London, J. B. Lippincott Co., 1923. Price \$9.00.

Fuchs' text-book now appears in its seventh English edition which has been entirely rewritten and rearranged. In some of the changes the translator has had the benefit of consultation with Dr. Fuchs and has drawn on the XIII German edition which was completely revised by Salzmann. Many other changes are incorporated by Dr. Duane; thus anatomy is now in a separate chapter, followed by development and physiology; refraction has been remodeled and augmented; numerous changes are made in the chapter on motility, and the sections on light sense, color sense, perimetry, and functional and objective examination are thoroughly brought to date. The parts on special diseases and operations have also been carefully revised and new illustrations added. The book now is an exhaustive, modern treatise, specially intended for the advanced student and specialist. Dr. Duane has placed the English-reading ophthalmologist under a great debt, not only by bringing this classical text-book abreast of the times in which he has preserved the spirit, and often the words, of Dr. Fuchs—but also by adding many personal contributions on subjects on which he is an authority. A. K.

III.—**Brain Abscess, Its Surgical Pathology and Operative Technic.** By Dr. WELLS P. EAGLETON, Newark, N. J. 297 pages with many illustrations. New York, Macmillan Co., 1922.

One of the main symptoms of compression of the brain is papilloedema. While general cerebral compression plays a part in producing changes of the optic nerve-head, the author believes that there are other causes. Papilloedema does not follow cerebral compression unless there is an obstruction of the intracerebral portion of the cerebrospinal fluid circulation. It consequently is absent in abscess of the frontal lobe, and the author thinks that its absence is one of the causes of failure to diagnose an abscess in this location. It frequently, however, develops after evacuation of the abscess in this location. Venous obstruction and an increase in the cerebrospinal fluid system circulation must both be present to develop a true nerve-head swelling. Papilloedema is usually due to an obstructive internal hydrocephalus; a moderate degree is found present in abscess of the cerebellum and of the temporo-sphenoidal lobe; the intense degree found in tumor never occurs. Papilloedema, according to the author, frequently originates from a blocking of the pathways by which the parenchymatous fluids from the nerve-head and optic nerve are discharged, the blocking being caused by changes in the parenchymatous fluid itself or in the cerebrospinal fluid. The author suggests that the filling of the intravaginal space with a pathological coagulable fluid or alteration of the perineural, pericapillary, or perivascular fluid, is the additional factor generally operative in the production of papilloedema in abscess of the brain. In many localized suppurations, cellular reaction to the toxic influence of an altered cerebrospinal fluid causes a mild papilloedema. Arterial contraction from disturbance of the central sympathetic system in the brain—either from trauma or toxemia—is a factor in some nerve-head changes.

Another important eye symptom is hemianopia in temporo-sphenoidal lobe abscess. It is due to the association fibers, the cuneo-pulvinar tract being caught between the abscess and the distended ventricle. In the author's experience, the hemianopia is latent in all abscess cases. To detect the frequently transient hemianopia, it is necessary to examine the visual fields repeatedly, both for form and for colors.

The book treats, in turn, general considerations of intracranial surgery, surgical pathology and operative technic of

brain abscess, surgical diagnosis, with appendices on guide to detailed neurological examination, cerebellar abscess with analysis of 125 autopsies, frontal lobe abscess with analysis of 140 reported cases.

The author has made a scientific and an original contribution to this important subject. In addition to a record of personal experience admirably illustrated by original drawings and photographs, the field is adequately covered by a careful study of the recent literature. The author is to be congratulated on the success of the enormous labor expended in this elucidation of a difficult subject which must equally interest the cranial surgeon, the ophthalmologist, and the neurologist.

A. K.

IV.—**A Treatise on Glaucoma.** By R. H. ELLIOT, Lieutenant-Colonel I. M. S. (retired), London. II edition, 656 pages with 213 illustrations. London. Hy. Frowde and Hodder & Stoughton, 1922.

The second edition of Colonel Elliot's book on glaucoma has been enlarged and rewritten, and is a welcome addition to our knowledge of this important subject to which the author has contributed so much. The reader will not only receive stimulation but assistance by exact information on many questions and opportunities for research which still remain open in this mysterious condition. The subject has been so well arranged that any point can be readily referred to. Important contributions and views are treated in a clear and analytic fashion and each section is brought to date. The chapter, which to the reviewer stands out, is the one on the diagnosis of glaucoma, a subject the importance of which has not been as fully grasped by the average ophthalmologist as it should be. Colonel Elliot's merit consists in not only having developed the operation of trephining, but in analyzing the symptoms of glaucoma, particularly as regards defects in the visual field which are demonstrated by perimetry with small objects. The book is essential to anyone working in this field. The amount of information, the sound judgment exhibited by the author, and particularly the fluent style of writing, all make it one of the most important contributions to ophthalmology in recent years.

A. K.

NOTICES.

OXFORD OPHTHALMOLOGICAL CONGRESS.

Master, SYDNEY STEPHENSON.

Deputy Master, PHILIP H. ADAMS.

Hon. Treasurer, SIR ANDERSON CRITCHETT, BART., K.C.V.O.

Hon. Secretary, BERNARD CRIDLAND, Salisbury House, Wolverhampton.

Past Master, THE LATE ROBERT W. DOYNE.

February, 1923.

Preliminary Notice.

The Oxford Ophthalmological Congress will assemble at Keble College, Oxford, on the evening of Wednesday, July 4th, next, and the Meeting will be held on Thursday, July 5th, and Friday, July 6th, with an extension to the morning of Saturday, July 7th, according to the length of the program.

On Thursday, July 5th, a discussion on "THE RELATIONSHIP OF DENTAL SEPSIS TO DISEASES OF THE EYE," will take place, to be opened by W. LANG, Esq., F.R.C.S. (London), and W. R. ACKLAND, Esq., M.D.S., M.R.C.S., Eng. (Bristol).

Members intending to take part in the Discussion are requested to kindly send in their names to the Hon. Secretary at their early convenience.

The Doyne Memorial Lecture will be delivered on the morning of Friday, July 6th, by H. M. TRAQUAIR, Esq., M.D., F.R.C.S.E., the subject being "THE DIFFERENTIAL CHARACTERS OF SCOTOMATA AND THEIR INTERPRETATION."

The Official Dinner of the Congress will take place on the evening of Thursday, July 5th, in the Hall of Keble College.

A General Meeting will be held during the Congress at a time of which due notice will be given in the final program.

It is hoped that members will contribute to the success of the Meeting with papers, pathological specimens, new operations, cases or novelties of any kind.

Notification of such at the earliest opportunity to the undersigned will be appreciated.

BERNARD CRIDLAND,
Hon. Secretary.

Salisbury House,
Wolverhampton.

FRENCH OPHTHALMOLOGICAL CONGRESS.

The 36th Congress of the French Ophthalmological Society will take place in Strasbourg, beginning June 11th.

A report on subconjunctival medication will be presented by Dr. Van Lint, of Brussels.

A reduction of 50% will be granted to the members of the Congress by the French railways on account of the holidays in connection with the centenary of Pasteur.

Beginning with Saturday, June 9th, there will be visiting of hospitals, of the Exhibition of Hygiene, excursions to Colmar, in the Vosges Mountains, and to St. Odile.

A detailed program will appear.

For further information address Dr. René Onfray, General Secretary of the French Ophthalmological Society, 6 Avenue de la Motte-Picquet, Paris.

ARCHIVES OF OPHTHALMOLOGY.

NEUROTIC DISTURBANCES OF EYE FUNCTION.

BY DR. LAWRENCE K. LUNT AND DR. AUSTEN FOX RIGGS,
STOCKBRIDGE, MASSACHUSETTS.

I. INTRODUCTION.

THE reason for presenting this paper is the request of a distinguished ophthalmologist for information in regard to the treatment of a certain type of case not unfamiliar in his specialty; and further, the observation of another that so many cases of slight refractive error with marked symptoms do not get the expected benefit from glasses. Therefore the object of this presentation is the consideration of a few cases where pain or other symptoms are referred to the eyes, but in which no organic condition can be found to account for the extent of the discomfort experienced.

It is presumed that any incapacitating ocular discomfort which persists over a period of many weeks without discoverable cause, and remaining unbenefited, or insufficiently relieved by appropriate expert treatment, has a large neurotic element in its causation; that it is therefore largely, if not entirely, functional in nature, and that the treatment requires more than mechanical correction by glasses. But before presenting cases typical of such a condition it is essential to consider the mechanisms that make this possible. As there is no organic disturbance it is evident that the malfunction must be of the nervous system. What, briefly, is the nervous sys-

tem of the so-called "normal" man, and how can it be so disturbed functionally as to give rise to distinctly handicapping conditions? And finally what can be done to relieve such situations?

II. PSYCHOLOGY.

Man is a unit made up of many different parts all welded together and coördinated. The "physical" part consists of the bones, muscles, integument and the various systems specialized for individual purposes, i.e.: the digestion, circulation, respiration, etc. The system whose function is to coördinate these other systems and make the whole a unit, is, of course, the nervous system. It effects this purpose by its peculiar ability to receive messages and to act on these messages so as to make a reasonably satisfactory adjustment to the constant changes going on within the body and in its environment. The reception of many different kinds of stimuli and the transference of the impulses that are set in action, to the central nervous system is made possible by the high degree of specialization in the sensory end-organs, and the connection of these end-organs with the central nervous system by means of the afferent or sensory nerves. Impulses are constantly streaming in over the several sensory channels, impulses that tend to give rise to visual, auditory, olfactory, gustatory, tactual, thermic and somatic sensations. All of these sensations are capable of reaching, but do not necessarily always reach, the higher levels of the central nervous system, the "aware consciousness." There is a more or less automatic selection from among the sensations presenting themselves, and this selection is effected by the attention. The sensations that succeed in reaching the aware consciousness are those that have sufficient value, either because of their innate importance, such as the pain from a cinder in the eye, or because the will chooses to place importance on them, such as observing attentively the afferent visual impressions from the printed page. Because the awareness is concentrated upon any specific afferent stream, does not mean that the other afferent channels are closed. They may be, as far as attentive selection is concerned, as when the attention is focused on the patient's

story and disregards the many noises that penetrate to the office from the city street. But it not infrequently happens that the attention registers an impression not pertinent to the situation and so quickly turns back to the business in hand, that we wonder where or when we registered that particular impression. The sensations that actually fail to register, though they are capable of doing so, do not, because of their failure to impress our attention with their importance—that is they do not cross the threshold into the aware consciousness. Should we voluntarily turn our attention to them, or should they become more insistent than those upon which our attention is centered, they cross the threshold, and for the time being occupy the attention. It is obvious that the attention cannot be occupied with more than one thing at a time, and therefore it ordinarily disregards what is not useful to the situation in hand. Given an absorbing object, we are capable of disregarding sensations that are even innately important, as when we hold ourselves at work in spite of the discomforts of a headache or a “cold.”

There is another type of afferent impulse that rarely reaches our conscious field, namely the splanchnic sensations, those that travel over the afferent channels of the sympathetic nervous system. This system, it is needless to say, is directly connected with the central nervous system, but its afferent impulses ordinarily stay below the level of consciousness. But when they do rise to consciousness, they do so either as general “feelings,” such as the feelings of a full bladder and the relief experienced after evacuation, or when excessive, as actual pain. It is conceivable and not improbable that the sensations that defy description, vague, illy-defined sensations so frequently complained of, have their origin in this splanchnic sensory division of the nervous system. And it is not unlikely that many unusual ocular sensations can be explained in this way.

Presumably in the perfectly normal body under perfectly normal conditions there are no untoward sensations that knock at the door of awareness but as this Utopian dream rarely if ever exists, it is a matter of almost universal experience to have, at some time, some persistent sensory demand. In the average individual, this demand is given appropriate care and

then ceases and is forgotten, relegated to the sub-consciousness. But such satisfactory, "normal" adaptation to sensory disturbances is not always made. The unpleasant sensations continue in spite of there being no adequate cause found on the most careful and scientific search by experts of unquestionable ability.

III. HYPERSENSITIVENESS.

Why should some individuals fail to make reasonably satisfactory adaptations to the unpleasant where others, under similar circumstances, succeed? Briefly, because these individuals mismanage their normal sensitiveness and thus make it over-sensitiveness, which expresses itself specifically in maladaptation to certain unpleasant sensations, feelings or conditions. By "sensitiveness" we mean that normal inborn quality, existing in probably a very large proportion of individuals and in a well-balanced manner, which causes one to react sharply to pleasant and unpleasant contacts, but which tends, when not intelligently evaluated, to make one over-react to these factors. It has been said that the best work in the world is done by sensitive individuals, and this is probably true. Hence sensitiveness is an asset in our equipment and over-sensitiveness obviously a liability. The over-sensitive individual exaggerates the value of some or even all of the sensations arising from inward physical conditions or outward contacts, thus leading to an unbalanced and therefore an inefficient type of behavior. The over-sensitiveness, as already indicated, generally becomes specifically attached to the sensations arising from some particular function, and is apt to specialize in these sensations. The over-sensitization has, as a natural accompaniment, an over-emotional valuation of the specific unpleasantness, and any other disturbing elements that may arise, thus creating a vicious circle, over-sensitiveness chasing over-emotionalism around and around, while over-emotionalism chases over-sensitiveness.

It must be remembered that all of this development of malfunction takes place in an intrinsically normal individual; that it does not require a diseased body or mind in which to grow, and therefore that it is essentially an inefficiency in the

management of a normal equipment, primarily because of misunderstanding or ignorance,—only rarely as the result of difficulties in the environment, and still more rarely, if ever, because of wilfully wanting to be sick. Furthermore, it is important to realize that the specific type of disturbance, set forth in this paper, is only one manifestation of a condition which can express itself through any of the other bodily functions. But it is apt to be overlooked in this special field because of the high degree of specialization to which Ophthalmology has been brought. The surgeon, internist, and the specialist in other fields, as well as the ophthalmologist, is familiar with the case where a specialized or generalized over-sensitiveness has been developed.

IV. HYPERSENSITIVE EYES.

In the field of Ophthalmology, the over-sensitiveness presents itself as discomfort or pain in or around the eye itself, or in other localities, the source being considered the eyes. The sensations complained of are varied, from frank ocular pain, blurring of vision, "tiredness," "weakness," or "heaviness" in the eyes, to all kinds of headache, and even mental confusion, and epigastric distress. There may not be sufficient deviation from the normal to justify even the simplest glasses, or there may be some slight defect in the lens or a minor muscular imbalance. Whatever the condition, the extent of the discomfort is far beyond what could be reasonably expected, and in despair a diagnosis of "congenital weakness of the eyes" is made, or else the less tolerant conclusion that the patient is a "crank." Undoubtedly there are cranks and congenitally weak eyes; but before such judgments are made, the personality of the patient and his method of reacting to his bodily sensations and to his environment should be studied.

Let us consider some cases of neurotic individuals where the outstanding feature was disturbance in ocular function. All of these individuals had become specialists in selecting the sensations arising in or around their eyes, till these sensations, from being either of normal or very slightly abnormal quality, had assumed an importance well beyond their true value, up to the point of incapacitation. Instead of the sensations being

valued correctly and disregarded, as is done by the average, they are exaggerated by being too constantly and fearfully under the attention.

V. ILLUSTRATIVE CASES.

Take for example the case of an intelligent woman of fifty, married for twenty-three years, whose grandfather had transmitted to his three granddaughters "very poor eyes." As a child she was "not very strong," and though there were no definite illnesses or apparent reason, she always saved herself and did not do as much as the other children, from the fear of possible injury to her health. Being of a rather timid type she avoided meeting strangers, and consequently did not make friends easily. But she was essentially of a friendly disposition and kept the friends that she did make. Thus early in life she began indulging her desire for self-protection and tended to an introversion of attention, and thereby an exaggeration of the emotions and sensations found within herself. She was happily married but suffered great disappointment because a pelvic condition, unremedied by operations twenty and eighteen years ago, prevented her having children,—a disappointment that frustrated her naturally strong maternal instinct, and to which she never completely adjusted herself.

A husband of none too robust and somewhat neurotic constitution, necessitated various moves,—to Florida, Oregon and South again,—each time with considerable apprehensive investigation as to the climatic effects on their health. Eight years ago an attack of typhoid served to concentrate an already too neurasthenic attention on various bodily functions and the sensations arising therefrom, especially the eyes and their sensations. Thus began the extreme condition of specific over-sensitiveness in which she is now found. Sensitive to her eyes because of family tradition and a slight insufficiency of convergence, she "strained" them during convalescence because her bed faced a window! A photophobia and continued ocular pain, said to be intense, developed and prevented all use of the eyes involving the slightest concentration of vision. This handicapped condition continued with negligible improvement in spite of the assurance of two of the country's

best ophthalmologists that it was not organic, and the prescribing of appropriate glasses to correct the slight abnormality. On admission she was able to use her eyes on reading and sewing for a total of only eight minutes a day, but with continued pain. She presented the picture of a person sadly resigned to bad eyes and impending blindness, and had even mastered Braille against the day when she could no longer see. She had a genuine desire to get well, and by re-education in which she fully coöperated, she had at the end of eight weeks attained to the use of her eyes in the concentrated efforts of reading and weaving, without discomfort, for a total of three and a half hours a day. This did not include the still further use with more or less concentration on odd jobs of sewing, doing picture puzzles, etc. In short her eyes were restored to normal usefulness.

Certain points of interest are worth reviewing. There was an unmistakable and rather striking family tradition of "bad eyes." There was a self-conscious shyness causing the development of a hypersensitiveness, becoming specific for unpleasant bodily sensations, particularly from the eyes. There was the aggravating source of contagion from a neurasthenic husband and the great disappointment of not having children. A serious illness (typhoid) served to fix the attention on self in terms of malfunction. And finally an intelligent coöperation in re-education resulted in complete restoration to full and comfortable function which, according to a report a year and a half later, has been fully maintained.

The next case is of a single man of twenty-five, of excellent inheritance both mentally and physically and a past history of no medical interest, except that he had worn glasses from boyhood. He graduated from school and college successfully and with many friends, and enlisted for war service. His two years in France were much to his distaste and a source of real disappointment, because he had to serve as instructor in an officers' training school while the unit with which he had gone overseas went into action. After being mustered out of service he had a few unpleasant months marked by continued irritating emotional stimulation from domestic problems. He then entered the Law School, and after passing his first year without trouble, went immediately into an office where he

worked nine hours a day and spent his evenings trying to learn more of his profession. After a few weeks of this he began to get "dopey" and sought the relief of an oculist. It is interesting that his first thought was that his eyes were the cause of his trouble. The suggestive effect of a change of glasses proved a temporary relief, but as the unpleasant sensations of tightness around his head, dizziness and faintness returned and increased, he stopped work. Rest in bed, change of climate and outdoor activity, with no use of his eyes, so far restored him that in three months' time he started the second year of his Law course. He only lasted a month in spite of honest effort, and then gave up almost in despair.

As in the first case, so this one was put on a gradually increasing schedule of eye training and by the end of eight weeks he was reading four one-hour periods with two hours between each period, with a certain amount of discomfort, but not enough to prevent progression, so that two weeks later only five minutes separated the reading periods. A report two years later states that he is about to complete his Law studies and plans to enter an office. An incident worthy of note, showing the force of suggestibility in a traditional idea, occurred midway in his training. He reported that he had been very unwise and as a result his eyes were particularly uncomfortable again: he had read for ten minutes before breakfast. Upon inquiry it was found that he had been brought up with the idea that it was harmful to use one's eyes on an empty stomach! An explanation that this notion was without foundation—a mere old wives' tale—and prescribing fifteen minutes' reading before breakfast as part of his routine, immediately dispelled this symptom.

Here we have the picture of a young, active and intelligent man in favorable circumstances without sufficient organic reason to account for his incapacity, entirely unable to cope with life as he had planned it for himself, bewildered by troublesome sensations. What factors of interest stand out in this case? First a definite sensitiveness, not grossly noticeable in social shyness, but in more subtle ways, as in an overcompensation evinced in a rather humorous self-depreciation, and by an easily disturbed facial vaso-motor stability. From the family it was learned that he was the favorite especially of his mother,

although he had an older brother and a younger sister. That his eyes had served as a focus for his attention was made evident from the fact that for years the consultation and oversight of a far-famed ophthalmologist in a distant city were thought necessary, although equally skilled attention could have been had close at hand. To this already overbalanced situation are added war service, with the frustration and disappointment of getting only hard trying work and no glory, emotional worry at a time when he most needed recreation, and then many months of hard intellectual work where there was a premium on sound eyes. Then in all probability the contact with the realities of his profession in the practical work of an office gave him an exaggerated feeling of inadequacy on the basis of his too ready self-depreciation, and he became self-conscious in terms of ocular sensations, magnifying these until they instituted a functional illness.

The third case is a young unmarried woman of twenty-five, also with a negative family history. At twelve years of age she had measles with the unpleasant involvement of the eyes that not infrequently accompanies this exanthem; and two years later, during her High School course, she had occasional headaches with dizziness which she attributed to her eyes. All her six brothers and her older sister were earning their own living and she felt it incumbent upon her to do likewise. Talented musically, she spent two years at a conservatory, but gave it up, because an overweening shyness in performance made her fear failure. On the occasion of giving up this pursuit she had a few weeks of mild depression dignified by her doctor as a "nervous breakdown," from which she made a good recovery. Thereupon she entered a business school, graduated and obtained a good clerical job; but in her spare time she worked at her music. At about this time she lost in one year her fiancé in the war, her mother, and then her father. A few months after the father's death she had "influenza" lightly. Two and a half months later her eyes began to feel strained and she took three weeks off. Following this she stuck at her job with difficulty for two months and then gave it up because of her eyes. She found that if she did not use her eyes at all she felt well, but the slightest use brought on ocular discomfort, a sense of pressure in the head and at times

even dizziness. These sensations "got on her nerves," and it was with great difficulty that she could even act as assistant to her sister and give three music lessons a week. The idea that she could not make her living because of the supposed handicap, gained ground, and amounted to a cause of a fairly serious depression, with a continuous feeling of "strain" in her eyes. A competent eye examination revealed nothing out of the ordinary and the opinion submitted was that the eyes could not possibly account for the condition. A general physical examination showed a normal body with an unstable vaso-motor system as evinced by cold moist hands and feet.

More detailed examination of her history brought out the facts that from early childhood she had been considered as having exceptional musical talent, and great things were expected of her by her family and herself. But she always lacked confidence at the crucial moments and therefore failed to realize the great expectation. However, she never gave up her music, her first love, and her desire to excel therein. While studying for and working at her clerical job, she was working on music and was continuously dissatisfied at not really fulfilling her ambitions, and at the same time she suffered a series of naturally severe emotional shocks. This emotional stimulation undoubtedly served to intensify the dissatisfaction which then assumed such proportions that she finally found escape by the route of functional disturbance of the organs upon which she had put the most attention in the past. She then gave up her work, and became, to all intents and purposes, an invalid. The usual course of intensive and carefully supervised training did not happen to be possible in this case, but sufficient re-education was absorbed and schedule maintained, along with a re-establishment of effort towards the normal and well founded ambition, to effect increase in self-confidence, and restoration to reasonable usefulness. Learning how it was possible and not unusual to get into such a sensory mix up, she found that she could disregard her bothersome sensations and not use them as means of escaping from possibilities of failure. Here, too, we find a basic sensitiveness plainly seen in her shyness, unwillingness to make friends, and a self-depreciatory trend,—a sensitiveness that easily became over-emphasized and specific to the eye sensations. Being of a highly self-

protective type, she attempted to make an escape from a course that was rather intensely disliked, and yet she could not make a satisfactory adjustment to the more to be desired course, so she takes the obvious road of escape on a basis of supposed illness,—a method that is doomed to failure. A point of interest in this case is the different social level of this individual. It illustrates the fact that “neurasthenia,” or whatever one wishes to name the functional nervous disorders, is not limited to the “upper classes,” where there may be no necessity for making one’s living. It cannot be emphasized too strongly, popular ideas to the contrary notwithstanding, that these disorders are not specific to any one class or social level. They are human disorders, irrespective of the occupation or bank account of the victim. The first two cases cited were in a financial position to have at least been assured of continued existence in spite of lack of gainful effort. But this fact in no way contributed to their breakdown. In the last case, however, work for a livelihood was a necessity, recognized and accepted—but neither was it a factor in the ætiology of her mal-adaptation.

VI. RECAPITULATION OF CASES.

Although widely different as individuals these cases show certain features in common. In the first place we find in each one an innate quality of sensitiveness. We can take it for granted with reasonable certainty, that in childhood each one was subjected to the adverse effect of an over-apprehensive regard for health and thus early in life became predisposed to future misinterpretation of practically normal sensations. In each there was a disturbing emotional element arising from circumstances, which, although partially accepted intellectually, were still persistently over-emphasized, and thus contributed to the breakdown. A disappointment or frustration of any intense natural desire, if not completely accepted and discounted, tends to persist as an underlying emotional imbalance, which makes fertile soil for the germination of neurotic seed. Frequently, but by no means of necessity, some physical illness or prolonged strain helps to upset the equilibrium, and constitutes the fabled straw that “breaks

the camel's back," and therefore it generally gets the blame for the break. In the first case typhoid fever, in the second the physical and emotional stress and strain of war service, and in the third "influenza," enter the picture in this rôle. Finally each individual possessed at least fairly well-trained intelligence. Here again we can advance evidence to upset the much too common belief that anyone "giving into nerves" is a "fool."

VII. THERAPY.

It is evident that this type of case requires more than the fitting of glasses. Where Ophthalmology leaves off, there Psychotherapy begins. In so brief a survey psychotherapeutic "re-education" cannot be dealt with in much detail, as each individual case must be approached and treated in the way best suited to his type of intelligence and personality; but the general principles can be briefly stated. In the first place, patients of this class are most effectively treated through their intelligence. The old style of therapy, that the patient must be kept in black ignorance of the nature of his malady and the medication used, cannot be tolerated here. Simple reassurance sometimes helps for a short time, but not for long. Neither will brushing aside the symptoms as "imaginary" be of much avail; in fact this often does a great deal of harm, as the average person knows what he feels, and if his doctor says it is imaginary the doctor is apt to be justly branded as ignorant. Most people who have to, or do use their eyes concentratedly, have at least enough intelligence to resent being told that their genuinely troublesome sensations do not exist. If they feel them, they are real regardless of whether there is physical cause or not, and they must be treated as real.

In the second place the physician must keep an open and tolerant mind. From his suspicion or knowledge, that the symptoms are not of organic origin, is apt to spring intolerance to the patient who presents this condition. When this occurs, the effectiveness of the doctor is almost sure to cease, for he then approaches the situation prejudiced against it, and therefore the most intelligent treatment is impossible. With a tolerant attitude then, the explanation begins, and it must be

as painstaking and patient as the need requires. On a firm scientific basis of common-sense mental mechanics, it is shown how such symptoms in the intrinsically normal individual can arise and persist without a sufficient organic basis. With this general knowledge the patient begins to see himself as not so different from other people, and finds out where he has made his mistakes in management of self; he learns to think of himself in terms of normal instead of abnormal function. This effect is not gained by "suggestion," the uncritical acceptance of the propositions, but by the use of intelligence, the acceptance of the propositions by the critical faculties. One point of great value in the specific psychotherapy of these "eye cases," is aimed at the habit that they are apt to have formed, of too detailed inspection of the object of ocular attention. They seem to almost try to spell out each word with a concentration that must of itself be fatiguing. They revert to the method of the child just learning to read, but they lack the freedom of responsibility of the child, and instead of the spasmodic effort of the latter, they attempt to hold the delicate adjustments of the eyes to genuinely tiring concentration. Therefore these cases are retrained to "glance at the print,"—to get a bird's eye instead of attempting a microscopic view. It is believed that by reteaching this method, which is automatically used by most people, a certain proportion of the prescribing of glasses for unimportant defects can be done away with. Finally there is careful oversight of the physical activities as well as the training of the supposedly handicapped function, so that the gains may become real and permanent.

It is obvious that it is not possible for those who are highly specialized in one field of medicine to go into another special field. The ophthalmologist has not the time, desire or training to attempt psycho-therapeutics, nor is it expected of him by his professional colleagues or his patients; but he can be of immense value in appropriate cases by the manner of his approach and treatment. By early recognition of the type of individual who tends to develop neurotic interest in his eyes, he can by common-sense advice often prevent serious functional incapacity. By recognizing the fact that "nervousness" is nearly always the cause of functional eye difficulties rather than vice versa, he can by adequate and intelligently explained

reassurance prevent the formation or continuance of an unnecessary handicap. And finally, by being willing to admit frankly and to take the trouble to explain why glasses are not necessary in certain cases, he will help to decrease the all too widespread dependence on artificial props, and thereby help to keep many from the ranks of the neurotically handicapped, making them more self-sufficient and more useful citizens.

THE EMBRYOLOGY OF TENON'S CAPSULE.

By DR. ISADORE GOLDSTEIN, NEW YORK.

(With four illustrations on Text-Plate XXIX.)

FROM THE EMBRYOLOGICAL INSTITUTE OF VIENNA UNIVERSITY.

ABOUT the development of Tenon's capsule, nothing is fully known. At least I could not find any information on this subject either in ophthalmological or embryological literature. To fill this gap in our knowledge, I examined serial sections of human embryos contained in the institute of embryology of the University of Vienna and have discovered some facts which will be of interest.

It is understood, of course, that the results of this research are in no sense exhaustive. For a complete solution of such questions serial sections of very many stages of development are necessary.

My material was insufficient for this since I have had to confine myself to the embryological material that was obtainable in this one institute. Still, I believe that, for the matter at hand, the following are decidedly important facts which should excite further investigation.

Serial sections of thirteen embryos were examined, and the Scheitel-Steiss length of the largest specimen came to fourteen centimeters.

The first appearance of Tenon's capsule I shall mark with a string of cells, visible in Figure 1 and marked C. T. The cut pictured here comes from a human embryo of twelve millimeters extreme length. It meets the fetal ocular fissure, through which may be seen the mesodermal string of cells covering the hyaloid artery progressing to the posterior surface of lens. The ocular cup therefore consists of a dorsal and a

ventral division, which are apparently connected. In accord with the tender age of the embryo, the retina has not yet separated into single layers; the lens is in the stage of the lens-vesicle. The anterior chamber and eyelids are not yet developed. At a short distance under the ocular cup a mass of cells can be seen arising from the rest of the embryonic connective tissue (mesoderm, mesenchyme) which are very closely pressed together and it can also be seen that many of them possess nuclei more distinctly colored and rounder than the nuclei of the other mesodermal cells. This mass of cells advances, under the inferior rectus muscle, to that place which corresponds to the future fornix inferior, a circumstance which, as we shall see, is important for the significance of this mass of cells as the first foundation or fundament of the capsule of Tenon.

This formation is evident in Figure 1 in the immediately under and forward part of the future Tenon's capsule. In this stage of development nothing is observed in the remaining parts. This foundation of the capsule of Tenon, as well as the connection with the fornix conjunctivæ, is quite plain in Figure 2.

The serial section in question comes from an embryo 15mm long. Here the differentiation of the retina into its individual layers has taken place. The lens fibers are formed and eyelids (P. s. and P. i.) are beginning to grow. The fornix superior is much deeper than the fornix inferior, and the epithelial beds of the future pars bulbi and pars conjunctivæ are readily seen. In the fornix superior the epithelial bed has already been partly separated by cleavage, while as yet it has not taken place in the fornix inferior. Around the eye-cup choroid and sclera are beginning to differentiate; eye muscles (rectus mediales, rectus inferioris, and obliquus inferioris) and also nerves here make their appearance. Deep branches of the motor oculi nerve are well developed. We now notice that the embryonic connective tissue around these muscles is more compact, and this forms a loose sheath for these muscles. This sheath appears in the under half of the section as entirely separate from its surroundings. It is composed of a firm mass of cells (C. T.) directing itself toward the fornix inferior, where it fuses partly with the tissues of the lower lid, the palpebral

ILLUSTRATING DR. ISADORE GOLDSTEIN'S ARTICLE ON "THE EMBRYOLOGY OF TENON'S CAPSULE."



FIG. 1. Cut through a human embryo 12mm extreme length, enlarged 44 times. C.T. Anlage of the capsule Tenon in its earliest development, represented by elongated cells with deeply staining nuclei.



FIG. 4. Cut through a human embryo 6.4cm Scheitel-Steiß length enlarged 44 times.

M.r.s. Superior rectus muscle.
M.o.i. Inferior oblique muscle.
M.r.i. Inferior rectus muscle.
M.r.m. Internal rectus muscle.
N.o. Optic nerve.

M.r.l. External rectus muscle.
C.T. Capsule of Tenon quite thick, eventually forming Lockwood's ligament.

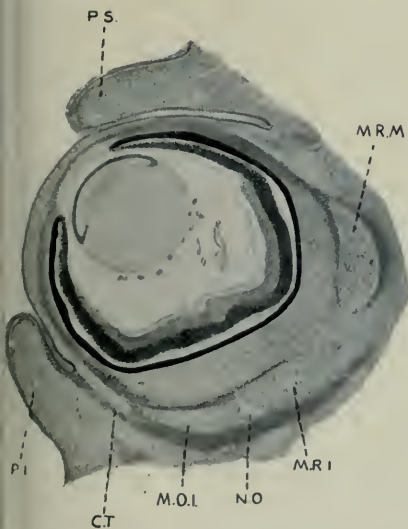


FIG. 2. Cut through a human embryo 15mm extreme length, enlarged 44 times. P.s. Beginning of upper lid. M.o.i. Inferior oblique muscle. P.i. Beginning of lower lid. N.o. A branch of the 3d nerve. C.T. Capsule of Tenon. M.r.i. Inferior rectus muscle. M.r.m. Internal rectus muscle.



FIG. 3. Cut through a human embryo 9cm Scheitel-Steiß length enlarged 56 times.

C.T. Capsule of Tenon.

C.p. Extension of the capsule of Tenon into conjunctiva of lid.

C.b. Extension of capsule of Tenon into ocular conjunctiva.

S. Sclera.

T.n. Tapetum Nigrum.

conjunctivæ, and ends apparently in the attachment of the cornea. This distribution of the cells will be seen clearer in Figure 3, which is a high power drawing.

Figure 3 shows a part of the lower section of the bulb of an embryo 9 cm Scheitel-Steiss length. Only the pigment epithelium (T. n.) is shown of the retina. Around this the choroid and sclera (s) are forming. The sclera lies on the tendon of the rectus inferior. Externally to the tendon of rectus inferior the embryonic connective tissue is very loosely arranged. This loose zone is surrounded by a thickly woven mass of cells, which represent the already known point of attachment of the capsule of Tenon. This mass of cells can be traced to the transition point of the conjunctivæ bulbi (C. b.). It can also be followed to the palpebral conjunctivæ (C. p.) with which it fuses. The part entering the conjunctivæ bulbi is wider, but becomes gradually thinner as it reaches the base of cornea. This cell-mass can be easily differentiated from other structures contained in the orbit by its histological characteristics. Its cells are long drawn out, spindle-formed, and lie in close contact. In form as well as in coloring capacity the nuclei differ from the others, i.e., they are more round and take the stain deeply. The transition of the cells into fibers is very clear at this stage of development.

The formation of Tenon's capsule proceeds quite rapidly, even before the stage of development used in Figure 3. It is already noticeable around the cone of the eye muscles developing there; this can also be noticed from similar sections. Figure 4 pictures such a section coming from an embryo 6.4 cm Scheitel-Steiss length. The dark circle corresponds to the cut into the pigment epithelium of the retina, the tissues around it show the points of attachment of choroid and sclera. The circle lying far towards the inner side is the horizontal section through the optic nerve (N. o.). The horizontal sections of several eye muscles are seen here. (The external rectus muscle consists of several masses of separate fibers.) All around these muscle insertions an enveloping zone can be observed, which consists of cells closely packed and distinguishable from the others.

This covering zone is evidently the capsule of Tenon. At this stage the capsule of Tenon shows a more pronounced

development in the lower part than in the upper part. (See Figure 4.) The capsule is very thick especially where it goes over from the rectus inferior to the obliquus inferior (M. o. i.) corresponding to the future ligament of Lockwood. On the inner surface of the eye muscles, the capsule in this stage is less developed than on the outer surface.

The development of the space of Tenon begins somewhat later and in such a manner that the tissues around the capsule of Tenon are loosened, while the intervals between the single cells become larger and coalesce.

These observations though produced with the limited material at hand represents the first attempt made to describe the capsule of Tenon in its very early development.

I submit this report in the hope that it will stimulate further pursuit of this little known but none the less important subject. *I here wish to thank Prof. Dr. A. Fischel for the valuable assistance extended to me in collecting material for this research.*

DISEASE OF THE OPTIC NERVE AND ITS RELATIONS
TO THE POSTERIOR NASAL SINUSES. REPORT
OF FOUR CASES SHOWING THE UNCERTAINTY
OF THE DIAGNOSIS.¹

BY DR. COLMAN W. CUTLER, NEW YORK.

AT a meeting of this Section in conjunction with the Laryngological Section, October 26, 1921, Dr. White, of Boston, read a paper on the accessory sinuses, and I had the privilege of describing the relations of the optic nerve to the sinuses, the methods of diagnosis, the indications for operation, and the danger incurred both in neglecting cases where vision was threatened by the inflamed sinus, as well as the risk of a too hasty operation with an incomplete diagnosis (1). Little, however, has been added to our knowledge of this subject since Van der Hoeve's excellent paper (2) in 1911 and his review of the subject in 1922, both in the ARCHIVES OF OPHTHALMOLOGY. Striking cases have been reported in which the diagnosis was promptly made, the operation successfully carried out, and the cure complete.

Perhaps enough has been said about the acute cases with an obvious connection between sinus and nerve, in which, with proper, discriminating care, a successful outcome may be expected. Undue emphasis on these fortunate and not infrequent cases may well lead to an optimism which would be misleading in the more difficult cases which it is our duty to consider. Less has been said of cases in which the diagnosis is difficult or impossible, and yet the appearance of retrobulbar neuritis with characteristic defects in the field, with diminishing

¹ Read before Section on Ophthalmology, New York Academy of Medicine, January 15, 1923.

vision, makes some attempt at relief very urgent. Such studies are needed. We may learn that a variety of conditions simulate canalicular neuritis very closely, and it is more important to report unsuccessful cases, and especially those in which the operation has met with unexpected or unusual difficulties, than to add to the large number diagnosed and relieved.

It would be well to consider whether we can classify the cases in which the nerve is affected in its short canalicular course. The peripapillary scotoma of Van der Hoeve has been considered a probable sign of disease in that region whether it was associated with a central or paracentral scotoma or not, but experience throws doubt on its infallibility. It is still fair to assume that inflammation of or pressure on the nerve in the narrow canal causes these symptoms in most cases and that the posterior ethmoid and sphenoid sinuses are the most frequent source of this subdivision of retrobulbar neuritis. That there may be other causes, however, the cases here cited will indicate.

Miss A. M. D., age 45, musician. Seen first January 20, 1921. Noticed a blur before the right eye three weeks ago. Headache not severe, variable, when tired. In November had had a severe neuralgia in right parietal region with vomiting, attributed to a bilious attack. No nasal symptoms, but in September and October had had a severe cold in the head. She had been treated by Dr. Coffin for a condition of the left ear. The sinuses were then thought to be normal. Vision: right eye $\frac{2}{3}$; left $\frac{2}{3}$. Pupils equal, react to light. Right, slight hippus, dilating after exposure to bright light. Both optic nerves, veins somewhat full. Right optic nerve slightly blurred upwards. The right field of vision was normal in its periphery with no central or paracentral scotoma; blind spot large. Left blind spot normal. Vision in the right eye fluctuated. In February it was $\frac{2}{3}$ - 2: with + 1.50 she read Jaeger 3 with difficulty. The left eye remained normal. During the winter of 1921 she had more or less cold in the head, and headache in the top of the head and through both eyes. Vision improved during the treatment of the nose by suction, to $\frac{2}{3}$, and as the rhinitis improved, the headache disappeared. There was no pain in the eyes or on pressure backwards or over the ethmoid. In March she had a severe headache in the top of the head and both eyes; vision failed slightly, although the blind spot was not as large and did not show the variations that had been so noticeable in January and February. In

May the vision in the right eye fell to $\frac{3}{8}$ and there was considerable blur, but no central or paracentral scotoma detected. The temporal half of the right nerve became pale. Arteries a little small, but the edges of the nerve remained sharp. There was considerable sensitiveness to light, but no disturbance of the light sense that could be made out. The right blind spot showed an interesting condition. It was large continuously and showed almost daily variations, with, at times, a paracentral scotoma, especially for red. Periphery of the fields remained normal. The failing vision, the variable blind spot, the slightly wider right pupil, and, towards the end of my observation, the pallor of the temporal half of the right nerve, were associated with a nasal condition sufficiently suggestive of sinusitis to justify the diagnosis of retrobulbar neuritis. A tentative exploration, after suction had been tried in vain, was made by Dr. Coffin, but drainage of the cells brought no relief. She passed into other hands after that and I have heard recently that she died a few weeks ago. The autopsy revealed an aneurism of the circle of Willis.

This history is interesting, as it gave several of the symptoms of a neuritis of the canalicular portion of the nerve, usually associated with disease of the posterior sinuses, and these symptoms were probably caused by pressure on the nerve at the chiasm in such a manner as not to affect the left nerve at all. It is of course possible that there was a retrobulbar neuritis arising from a sinusitis also, and the early improvement following Dr. Coffin's treatment added weight to this view. It is a great pity that the specimen could not have been obtained, as the mechanics of the pressure is obscure. It is possible, however, that pressure from behind can cause enlargement of the blind spot and simulate retrobulbar neuritis of canalicular origin and it is possible that intracranial pressure, without choked disk, may cause the same symptoms.

J. C., age 23. Seen first Sept. 28, 1922. Headache over both eyes for four months. Inability to do continued work. Patient had been a brilliant student at college, but on entering a professional school his former capacity for intensive work had failed rather suddenly. No apparent signs of disease or of toxæmia. His condition at that time did not justify hospital care, so no examination of spinal fluid was made, but blood Wassermann, urine, were negative. Habits good. General appearance that of a healthy man, but

showing a certain lassitude, with fatigue of eyes and inability to concentrate. No nasal history. A thorough rhinological examination by Dr. Bowers was negative. X-rays negative as regards sinuses and sella. Vision, R. and L., $\frac{3}{8}$, J. I at 14cm. Muscular balance normal, but with slight insufficiency of convergence. The lids seemed heavy as if both levators were weak, but no true ptosis. Pupils equal, react promptly. No history of diplopia. The optic nerves were congested, the right blurred upward and the left showing striation of nerve fibers at its lower edge. Fields of vision, normal periphery, although the upper limits have been slightly narrowed at times. Blind spots have been larger than normal, with considerable though variable enlargement for red and blue. At the last examination, Jan. 3rd, the heaviness of the lids was a little more marked and he stated that he had been sleepy, 10 to 12 hour sleep being necessary.

In view of these vague symptoms, it seems as if we had to do with an encephalitis lethargica of unusual duration. Dr. Samuel Lambert is inclined to this diagnosis. The enlarged blind spots, with the congested and slightly blurred nerves, may indicate a low grade of retrobulbar neuritis, which would add an interesting symptom to this perplexing disease, and would also add a condition to be considered in the diagnosis of the group that we are discussing.

Miss J. D., age 16. Feb. 14, 1922. A normal appearing girl, somewhat pale, with a neurotic heredity. She had been working at school rather harder than was her custom or choice and had been irregular in diet and was evidently disordered as to digestion as shown by the skin and tongue. After prolonged study for examination she complained that the eyes ached severely and this continued in spite of rest and atropin. There was no history of nasal symptoms; the X-rays of the head were normal. The eyeballs were quite tender to pressure.

Vision: R. E.: $-0.75 \text{ C} - 1. \text{ axis } 115 = \frac{3}{8}$; L. E.: $-0.75 \text{ C} - 1. \text{ axis } 35 = \frac{3}{8}$.

Fields will be considered later. Both nerves showed slight veiling of nerve fibers, although the edges were visible. Vessels slightly over-filled. Pupils normal. No muscular insufficiency. Injudicious hygiene at school and overwork may have been the exciting factors in this case. The predisposing factors are described by Dr. Charles Jack Hunt in the following statement:

"Miss D—— did not present evidence of bacterial intoxication. Foci are not demonstrable by clinical or cultural methods. This includes the respiratory, gastro-intestinal and urinary systems. The pelvis was not examined, but I have every reason to accept a negative history.

"The chief complaints (other than ocular) were fatigue, insomnia, anorexia and apprehension associated with school examinations.

"She had tonsillectomy and adenoidectomy during the year previous to this study. Following operation she lost 30 lbs. in weight. She now weighs 129 lbs.—a gain since last fall. Acne developed at 14 years (2 years ago) and is worse when at school and with menses. She fears examinations, is willful, 'suffers' with polyphagia, though the appetite is often capricious. It was customary to consume much fruit, chocolate bars and peanuts between meals while at school. The diet included meat twice each day with bacon, butter, creamed foods, eclairs, ice creams, etc. Satisfactory details otherwise were not obtainable.

"Thirteen days prior to first examination she was sent to the school infirmary with nervousness, nausea, vomiting and nostalgia. This was concurrent with the onset of pain 'about and in both eyes.' It is clear that the actual onset was *not abrupt* though the presenting symptoms (as stated) would indicate such an onset.

"Physical examination showed a well nourished, relatively tall girl with pallor of skin, bright red mucous membranes, redundancy of nasal and oral lymphoid structure, papular acne vulgaris of face, neck and upper third of trunk; moist and cold hands and feet and mild acrocyanosis. Despite rather widened palpebral fissures and hyperæsthetic reaction to touch, the expression was dull and the attitude relaxed.

"The thyroid gland was visibly irregular in size, the right lobe larger than left, free from local masses, pulsation and tenderness.

"Examination of the lungs, pleuræ, mediastinum and pericardium was negative.

"The heart was normal in position and size. There was a considerable degree of myocardial irritability. Diffuse pulsation with vibration of pericardium was present at times, but adventitious sounds and thrills were not observed. The rhythm was regular, rate varying from 96 (recumbent) to 126 (standing). The blood pressure (patient recumbent with Hg method) varied from 140 S to 102 S and from 78 D to 60 D.

"The abdominal findings included a very sensitive transverse duodenum, tenderness of cecal and appendix regions, mobility of right kidney (as found in hypoasthenical types)

and an abnormally large amount of tympany of the gastroduodenal and cecal regions. The sigmoid flexure was very spastic and somewhat tender. There was no clinical evidence of ulcer, appendicitis, cholecystitis or colitis.

"The nervous system was studied repeatedly. Progress toward recovery was rapid, hence notes only of the first examination are included in this report.

"The sensory system showed the most marked signs. Joint and muscle sense, sense of position and stereognostic sense were apparently normal. Symptoms and signs were absent in examination of the 1st, 7th, 8th, 9th, 11th and 12th cranial nerves. Examination of the 2nd, 3rd, 4th and 6th as previously noted. In the regions supplied by the 5th cranial and all spinal nerves, there was definitely marked deep pressure pain. Bilateral superficial algesia in the distribution of the 5th cranial nerve and of the abdomen and feet. Thermal sense was acute, especially for heat (50° C). Tactile sensation was not impaired.

"The tendon reflexes were brisk—equally so on both sides. Patellar and ankle clonus were absent. Cutaneous reflexes were exaggerated sufficiently to make examination difficult, but variations from normal reactions were not found. The organic reflex activity was not tested. However, a history of spincter dysfunction was not had.

"The gait was normal. The station was impaired, the body swaying posteriorly and to both sides but corrected by coördination tests. The latter were negative. There was a very rapid, fine and regular tremor of the extended hands and feet, attempts to study fatigueability (especially of reflexes) was not successful, mainly because of lack of coöperation. Occasionally a crossed reaction was obtained with patellar reflex.

"Examination of the motor system was negative by every method in use except instrumental measurements.

"*Urine examinations* showed high sp. gr. (1030) gradually falling to 1015; large amounts of acetone, aceto acetic acid, marked reaction for indoxyl sulphate tests, traces of albumin and sugar, recurring presence of casts and calcium oxalate crystals.

"Chemical examination of the blood showed:

		Normal
N. P. N.	42.3 mgms	30-35 mgms
Urea N.	21.1 "	12-18 "
Uric Ac. N.	7.6 "	3 "
Sugar	122.2 "	110 "
Cholesterol	218 "	150-180 "
C O ₂	46.5%	53%

"*Diagnoses* of diffuse perineuritis and thyreotoxicosis were made. The painful bilateral cutaneous and deep hyperæsthesia, absence of areas of anæsthesia and of motor disturbances, and the presence of definite thyreotoxic signs led me to believe that a diagnosis of hysteria could not be made. That a 'neurosis' was a basic factor in the clinical picture is, of course, obvious. It seemed wise to defer further study of the thyroid gland in order to correct the immediately acute pathology.

"In the absence of chemical poisons, bacterial intoxications, trauma and states of malnutrition, the only probable cause of perineuritis would seem to be found in disturbed metabolism. Of the last named, involvements of the nerve trunk are more commonly found in disturbances of fat metabolism (3), (4), (5), (6). Suboxidation of fats leads to the formation of ketone bodies, of which beta-hydroxybutyric acid, acetone, and aceto-acetic acid (diacetic acid) are present in excess and easily recoverable (7), (8), (9). Such a disturbance of metabolism is manifested in a reduced alkalinity (of the blood), that is, a reduction of the CO_2 combining power of the blood plasma, the presence of acetone and aceto-acetic acid in urine, acetone odor to the breath, changes in the respiratory quotient, and evidences of widespread toxæmia affecting, particularly, the function of the nervous system. All these and other confirmatory findings were present in the case of Miss D——, who showed definite evidences of a diffuse perineuritis. Such changes in the fundamental metabolic processes may be the single basis for the neural pathology and is, theoretically, a basis upon which bacterial intoxications become active."

The treatment was confined entirely to a very restricted dietary both as to quantity and simplicity, increased intake of alkalies, passive exercise, and improved elimination. In the course of about five weeks the very marked changes in the fields of vision entirely disappeared and the eyes became normal coincident with the improvement of her peripheral nerves. On March 20th vision was $\frac{3}{8}$ +. Fields, periphery, blind spots normal. No fatigue after prolonged reading. No tenderness on pressure over eyes.

This case is especially interesting because there were no signs of focal or other infection and the only explanation (unless one attributes it to a pure hysteria, which seems highly improbable, as there were no other signs of such a neurosis) is the one offered by Dr. Hunt, of a metabolic poisoning, especially

as his treatment resulted in complete relief of the symptoms. I was tempted to urge an exploration of the sinuses in spite of no rhinologic symptoms, because of the marked changes in the visual field and the blurring of the disks, but Dr. Erskine's positive statement that the sinuses appeared normal, and Dr. Hunt's belief that the toxæmia might account for the condition, led us to postpone operative interference, which, judging from the outcome, was a fortunate decision.

In a paper by Dr. L. M. Francis (10) discussed by Dr. de Schweinitz, entitled "Two Cases of Acute Retrobulbar Neuritis Associated With Marked Acetonuria," some of the problems suggested by Dr. Hunt were considered. It is believed that a careful study of other forms of ocular disease may lead to important steps in our knowledge of the association of the nerve and retina with metabolic changes. Such studies are not lacking, but the direct connection is not easily established. In this case there was disease of the optic nerve, there were marked metabolic disturbances, and the progress to complete recovery was not a coincidence but an evidence of the ætiological relationship.

Miss E. P. M., age 23. Stenographer. Sept. 6, 1922. Right eye painful since May. Operation on the nose in Albany in July, the right posterior ethmoid having been drained. Had had severe right orbital headache since, with extreme tenderness in the brow and eye, with an area of analgesia over the inner angle of the eyebrow. Vision: right eye, light perception; pupil wide, immobile; fundus normal; left eye, $\frac{2}{8}$, Jaeger 1 to 20cm; pupil normal. Fields are described later, in connection with those of the previous case, to avoid repetition. X-rays negative.

Sept. 14th. Both nerves were congested but not swollen.

Sept. 16th. Vision, R. E. $\frac{2}{8}$. Dr. Monroe opened a posterior ethmoid cell or a wing of the sphenoid and thought that there was pus.

Sept. 22nd. Vision $\frac{2}{8}$ +. The left nerve was a little more congested and there was some perivascularitis, but the edges of the nerve were clear.

October 2nd. Vision: R. E. $\frac{2}{8}$; L. E. $\frac{2}{8}$. Left blind spot enlarged. The right pupil remains large and immobile. It is wider than one expects with a third nerve paralysis alone and as if there were sympathetic irritation. Does not react consensually. Left, normal: contracts to light and consensually. The central vision improved gradually to $\frac{2}{8}$

on October 11th, $\frac{3}{8}$ October 13th, and at times the right pupil would become less dilated without any apparent reason, and react slightly, and the next day would be dilated and immobile. The right nerve remained red with full veins.

October 20th vision in the right eye was $\frac{3}{8}$ — 1. On account of the slight enlargement of the left blind spot, the left middle turbinate was removed on October 24th by Dr. Monroe.

October 26th. Vision: right eye $\frac{3}{8}$ full; left eye $\frac{3}{8}$ +.

October 31st. Right pupil smaller, reacts to light direct and consensual.

There was a marked area of complete analgesia in the right supraorbital region and various symptoms of a neuritis. In addition, the toxæmic condition was very similar to that described in the previous case. She also developed symptoms of profound hysteria, with paraplegia and changing anæsthesia, anorexia, and insufficient elimination, which led Dr. MacPhee, who assumed charge of the case, to send her to a sanitarium and she is still under observation.

In this case we have changes in the field simulating and probably due primarily to sinusitis; profound toxæmia followed by major hysteria; pupillary changes which have puzzled neurologists who have seen the patient and which seem inexplicable:—certainly complications which illustrate the difficulty of diagnosis and the possibilities of which should never be ignored. The relations of the sympathetic nerves to the posterior sinuses have been described by Dr. Haskins, (11) and in view of the pupillary changes the influence of the autonomic system should be kept in mind. The relations of the motor nerves to the sphenoid are described by Haskins and Onodi.

The fields of vision in these two cases were not unlike. In the first instance, Miss J. D., the contraction was concentric at first in both eyes, clearing up gradually and leaving the blind spots enlarged, but with slight diminution of central vision and no central or paracentral scotomas. Evidently the central bundle was not affected. In about a month, as was noted, the eyes became normal in every respect. In the last case, Miss E. P. M., the left or better eye, was at first normal. Later the blind spot became enlarged and the nerve congested. In the right eye, vision at first light perception, gradually

improving to $\frac{3}{4}$ or better, but always with a very marked concentric contraction of the field and almost complete loss of color perception except for red at the fixation point. This may be considered a hysterical field, especially in connection with the later developments, but the enlarged blind spot on the other (left) side, and the improvement of central vision after Dr. Monroe's operation and Dr. Hunt's treatment, lead me to believe that there was an organic basis as well. It would be interesting to give the charts of the fields and the blind spots but the kaleidoscopic changes which are characteristic of these cases make it impossible to delineate them adequately.

In conclusion, certain questions are pertinent which cannot be answered yet with confidence, but which should stimulate discussion.

1. Does sinus disease affect the eyes often enough to make it important to watch?

Yes. In a considerable number of cases the blind spot is somewhat enlarged, especially for colors, where there have been recurrent colds, particularly where the nose is obstructed by septum or turbinals. Such cases are advised to have the nose treated, but the question of operation is not raised unless the peripapillary scotoma increases or there are other defects of the field or other signs of retrobulbar neuritis. These patients can usually be helped, and danger avoided, by hygiene and care of the nose, but they should be watched and a thorough general examination should be urged.

This raises the question of the importance of an enlargement of the color margin of the blind spot. Van der Hoeve in his earlier paper put much stress on this symptom. It is present in many cases, but it seems unwise to base a conclusion on it without corroborative symptoms. It is, however, a frequent accompaniment and precursor of a true peripapillary scotoma. A case in point was seen recently in which the blind spots for form were at first nearly normal, but the loss for red and blue upwards was very striking. The nerves were congested, but not swollen. Vision normal. No central or paracentral scotoma. The patient had an acute condition affecting chiefly the posterior sinuses. Dr. Saunders considered that the condition of the nose and sinuses would improve in a week or ten days and that there was no indication for operation. The

later observations of this case showed a severe acute inflammation of both sphenoids, based on a chronic sinusitis. The blind spots became very much enlarged vertically. Central vision normal. Operation improved conditions and the nerves and vision are now normal.

2. Do we invariably get eye symptoms, and if some individuals escape, why are they immune? Would the great anatomical variation in cells account for this?

The percentage of sinusitis with eye symptoms is probably small. This is due to the protection afforded the optic nerve by the bony wall. In spite of Onodi's very striking statements and pictures, it is probable that the optic nerve is free in the sinus or exposed directly to its contents in comparatively few instances. If it were free, retrobulbar neuritis would be much more frequent than it is. Whitnall (*The Anatomy of the Human Orbit*, p. 29) states that the bony wall which separates the optic canal from the posterior ethmoidal or sphenoidal sinus is often only 0.5mm thick. Francis and Gibson (*loc. cit.*) found a very thin wall in 38% of cases. Dehiscences are rare, 1 in 50 skulls, 2 in 200, while Whitnall had seen but one case. A thin wall is, however, a poor protection against pus, especially in a shut in cell and under pressure.

3. Are we more apt to get an enlarged blind spot from posterior cell disease, and if so, why?

The reason for the association of retrobulbar neuritis with posterior sinusitis is contiguity, the narrow optic canal, and the vascular relations. Inflammation of the anterior cells, ethmoid, frontal and antrum, is important in this connection only when it forms a part of a pansinusitis; but it should be borne in mind that while the frontal and other anterior cells may be conspicuously inflamed, an unsuspected posterior ethmoiditis, possibly a shut in cell, may be the actual source of danger to vision. Of course, optic neuritis or uveitis may arise from inflammation of the antrum or other cells, as from any other distant focus, as tonsils or teeth, but that is not our problem.

4. What symptoms occurring in an eye patient should make us suspect sinusitis?

Peripapillary scotoma first, but that might attain considerable size before attracting attention. A small scotoma at or

near the fixation point would be noticed at once. Inequality of the pupils. Insufficiency of convergence and accommodation, and tenderness to pressure of the eye ball directly back, due to inflammation at the apex of the orbit; some pain on moving the eye, especially on convergence; sometimes temporal or parietal headaches; hyperæmia of the optic nerve, very rarely papilloedema—may be early symptoms.

After the detection of the neuritis, the symptoms of greatest importance are, the changing field, the variable blind spots and scotomata, which afford the chief guide to operative needs and to prognosis. If there are no ocular symptoms, sinusitis may of course exist. If, on the other hand, symptoms of retrobulbar neuritis are present, we must consider two types: First, stationary, in which we can safely await developments (and these are perhaps more frequent), and, second, the progressive cases, in which vision is threatened early and something must be done. In these, if no other possible diagnosis is available, the rhinologist should be asked to promote drainage in the most effectual manner, and if that is not sufficient, to explore the posterior cells, both ethmoid and sphenoid.

5. What other conditions are likely to be confused with this? And how can they be differentiated?

It is probable that the most frequent cause of peripapillary scotoma—excepting, of course, myopia, glaucoma, medullated nerve fibers, and choked disk, all diagnosticable with the ophthalmoscope, is an inflammation or pressure affecting the optic nerve in its canalicular portion. Three autopsies are on record. In two a tumor of the sphenoid caused a central scotoma by pressure on the axial fibers. In the third, pansinusitis, the extension of the inflammation through the bony wall to the sheath of the nerve was shown. Unfortunately no reference to the scotoma is made. (Van der Hoeve, de Kleyn and Gerlach.) But there may well be diseases which would cause these symptoms. I have mentioned three: Aneurism of the circle of Willis, possible encephalitis, metabolic toxæmia, and a fourth, with possible sinusitis complicated by toxæmia and a profound hysteria. It is well to remember Van der Hoeve's words in speaking of central scotoma including the blind spot:

"These symptoms are important as they are symptoms not of a sinus affection but of an affection of the optic nerve. They show that the optic nerve is diseased but do not teach us anything about the origin of this affection and we always must remember that every retrobulbar neuritis can begin with these symptoms whether it is caused by multiple sclerosis, by tuberculosis, syphilis, dental infection or rheumatism, or by nasal disease."

In a recent paper by Emory Hill (12) an enlarged blind spot is mentioned as a fairly frequent symptom of pituitary disease. A very interesting paper by Walter E. Dandy (13) describing the prechiasmal intracranial tumors of the optic nerve, should be read with care. There are some points in this paper which arouse the interest and stimulate the specialist to renew efforts in the field of a more exact diagnosis, which, in spite of Dr. Dandy's predictions, often seems elusive. It would be of great interest to discuss these subjects from the standpoint of the ophthalmologist.

6. (a) What is the prognosis untreated?

(b) How long can we delay operation, and what ocular improvement is likely?

(c) Should we insist or merely advise? What results have we seen in actual purulent sinusitis? In cases with negative rhinological and X-ray findings, from simply drainage?

(a) Good, if the case is not progressive and acute, with drainage and care of the nose. Bad, in the severe and purulent cases, if neglected.

(b) Restoration of vision has been obtained promptly in recent cases; even where vision has been much impaired for a considerable time, partial relief has been obtained by an adequate operation, and in one case (*Jung. Gr. Arch.*, lxxiv., p. 266) of complete blindness for at least ten days, with profuse purulent discharge, vision of one-third of the normal was obtained by treatment with adrenalin and suction without operation.

In most cases where the diagnosis has been established and the optic nerve has not suffered irreparably, improvement can be expected if drainage of the infected sinuses is accomplished.

(c) It does not seem the part of the ophthalmologist to dictate to the rhinologist, especially when the X-ray and

rhinological findings are negative. But there are exceptions to this rule. Every case is a law unto itself. Van der Hoeve deals with the subject judicially and in his paper, and in my conclusions in the *Laryngoscope*, August, 1922, stress is laid on the need for conservatism in diagnosis, with all reasonable attempts at the simple methods of treatment compatible with preservation of vision.

Let me repeat: Most of the cases with Van der Hoeve's symptom are probably cases of retrobulbar neuritis with sinusitis. In these the sinuses and the eye must be studied simultaneously and with equal respect, and with due regard for the history, the condition of the pupil and convergence and accommodation, with pain, and tenderness on pressure, the diagnosis is usually possible. The treatment depends entirely on the nature of the case and is chiefly influenced by the vision.

In a few cases such as I have described, the diagnosis will be more difficult. I think these may be considered exceptional, but it may be that as attention is directed to the subject they will be found to be more numerous. In any event the complications of diagnosis may well cause an ophthalmologist some scruples when urging what seems to be a major operation, even in the most competent hands.

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1. *The Laryngoscope*, August, 1922.
2. VAN DER HOEVE. ARCHIVES OF OPHTHALMOLOGY, 1921, and May, 1922.
3. KREHL states that all the evidence indicates that the medullary sheath plays the most important part in a selective action of toxins (both metabolic and bacterial) on nerve fibers. "The Basis of Symptoms," *Clin. Path.*, KREHL. Multiple sclerosis, with its uncertain ætiology and varied clinical manifestations, has been shown to have a similar neural pathology.
4. FEILING, quoting from numerous observances, states that fatty changes are characteristic in medullary sheaths. Feiling, quoted by Krehl.
5. WILSON noted degenerative (fat and other) changes in perineural sheaths and ganglion cells in disease of thyroid glands. *Asso. Am. Phys.*, 1916.
6. BERNHEIM. *Révue Méd. de l'Est*, 1912, xliv., 21.
7. NOLL. *Zeit. Phys. Chem.*, 1899.

8. NESBITT. *Jour. Exp. Med.*, 1899.
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11. HASKINS. *Trans. Amer. Acad. Ophthal. and Oto-Laryn.*, 1912.
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13. DANDY, WALTER E. *Amer. Jour. of Ophthal.*, March, 1922.

CONCERNING THE SURGICAL TREATMENT OF GLAUCOMA, WITH SPECIAL REFERENCE TO A MODIFIED ELLIOT-LAGRANGE TECHNIC.¹

By DR. DERRICK T. VAIL, CINCINNATI, OHIO.

(With one figure in the text.)

IN dealing with this subject, the surgical treatment of glaucoma, there are four main types of the disease to consider, viz.:

- (1) Acute inflammatory glaucoma.
- (2) Subacute inflammatory glaucoma.
- (3) Secondary glaucoma.
- (4) Chronic non-inflammatory glaucoma.

Since the surgical treatment in these four general types varies, much may be written but I shall dispose of the first three types, viz., acute inflammatory, subacute inflammatory and secondary glaucoma, with a few words, not that they are unimportant but because their surgical treatment is generally well understood and usually satisfactory.

ACUTE INFLAMMATORY GLAUCOMA (FULMINATING GLAUCOMA).

In acute inflammatory glaucoma there is a sudden onset of great pain, marked oedema, chemosis, redness, and rapid loss of vision. The surgical treatment is a von Graefe iridectomy. This operation should be done without delay. The incision, starting well back of the limbus, is carefully executed with a sharp keratome, the iris is then grasped with iris forceps, carefully withdrawn and the iridectomy executed with two snips

¹ Read before Ohio State Medical Society at Dayton, Ohio, May 2, 1923.

of the iris scissors. First the right arm of the withdrawn iris is cut, then some stripping is employed to tear the iris loose at its root and finally another snip cuts the left arm of the withdrawn iris. This operation, successfully executed, usually puts an end to all symptoms, the eye generally recovers with excellent vision and the cure is actual and permanent as a rule. Acute inflammatory glaucoma is a rare disease. In a large ophthalmic practice extending over many years I have not encountered over a score of typical cases.

SUBACUTE INFLAMMATORY GLAUCOMA.

Subacute inflammatory glaucoma is that type in which there occur exacerbations of hypertension within the eyeball causing acute redness, pain, visual halos, and some loss of vision during the storm but in which during the intervals between the attacks there is usually at first no marked evidence of the disease: the vision in the interim is usually excellent, the fields of vision are either normal or fairly good, the optic disk is usually not markedly cupped and there is not much if any ophthalmoscopic evidence of atrophy of the optic nerve.

In this type of glaucoma eserine solutions dropped in the eye at short intervals will usually abort the attack and bring about rapid and remarkable relief of all symptoms. Unfortunately each recurrent attack seems to add a little more to the damage done to the intraocular tissues and leaves the eye more prone to further and more frequent attacks so that the cure is not permanent. The disease, or "glaucoma habit" as it may be called, is permanently established and hence the prognosis is that blindness will sooner or later supervene. When blindness does finally occur we note the presence of dilated pupil, shallow chamber, deep cupping and atrophy of the optic nerve head, engorged conjunctival blood vessels and marked plus tension of the globe. These eyes take on a certain marble-like appearance and constitute the so-called "glaucoma absolutum."

Knowing full well what the ultimate fate to the sight will be the question is, shall we be satisfied to employ eserine drops and temporize through attack after attack? It requires some courage to operate for the relief of this type of glaucoma for

we know that eserine solutions will abort the attack, and the patient also knows that medicines dropped in the eye will afford relief, nevertheless we should advise operation. Personally I am satisfied with performing what is now, in some places, called a "Smith iridectomy."

The Smith iridectomy is performed with a narrow-bladed sharp Graefe knife. The point of the knife is made to enter the eyeball far back from the limbus and is advanced until it appears in the anterior chamber. The blade is slowly pushed still further until the point reaches the upper margin of the pupil. Then the handle is lowered to cause the point to enter the extreme angle of the cornea behind the limbus and then the knife is turned so that the edge is vertical with the cornea. The incision is now quickly made by lifting the handle of the knife to cause the edge to cut from place of entrance to the point of the knife blade (not by counter puncture and sawing). The iris is then picked up with iris forceps and abscised with two cuts as described above where mention is made of the iridectomy in acute inflammatory glaucoma. This operation is not difficult to perform and usually (though unfortunately not always) establishes permanently normal tension without the occurrence of further attacks. I am certain after much experience with many operations that the results with the so-called "Smith iridectomy" in this type of glaucoma compare favorably with those of any other operation in vogue and to me this is (in this type of glaucoma) the operation of choice.

SECONDARY GLAUCOMA.

The surgical treatment of secondary glaucoma, depends upon the primary disease or cause. If it be cyclitis or uveitis, operation is often not necessary for the disease may depart if atropine is withdrawn, eserine in weak solution substituted, hot moist applications resorted to along with a good calomel purge and rest in bed. Salicylate of soda administered inwardly will have a more favorable influence on the disease than iodide of potash for the latter, on account of the liberation of free iodine in the aqueous humor, is very irritating to the already inflamed iris; indeed, I have often observed that glaucoma asserts itself in cyclitis in those cases where K. I.

has been administered and have, in these instances, thought it to blame for the production of the complication.

In some cases of this type, especially when it is discovered that eserine does not relieve the tension, it is best to stop its employment and resort to paracentesis of the cornea with a small but actual incision through the limbus on one side performed with a sharp Graefe knife.

In cases of glaucoma secondary to the needling operation for cataract or in cases of glaucoma complicating traumatic cataract in young subjects it is necessary to perform a linear incision through the clear cornea opposite the middle of the iris above by means of a keratome and evacuate the swollen lens substance with a curved grooved spatula or Daviel spoon pressing on the upper or limbal side of the incision, and this supplemented in some cases by irrigation of the anterior chamber with warm normal saline solution.

The best surgical treatment for glaucoma, following long after cataract extraction, is iridectomy of that arm of the iridocoloboma that is adherent to the inner side of the wound.

Much more should be written concerning the surgical treatment of the above-mentioned types of glaucoma as well as in their variously modified expressions for I have not given them the notice their importance deserves but my paper is written to deal with the much more common type of glaucoma, the non-inflammatory form, or what was formerly called "Glaucoma Simplex," the type of glaucoma of which we see the most and about which we know the least both as regards its cause and its surgical management.

Let us first generalize in our remarks concerning chronic non-inflammatory glaucoma and then specialize as regards its surgical treatment.

The textbooks' description: "Glaucoma is a disease of the eye *due to* increased intraocular tension" should read "Glaucoma is a disease of the eye *causing* intraocular tension," for there was especially in the case of so-called "glaucoma simplex" at least, a potential pathological process at work within the eye, we will state long before there was any demonstrable rise of tension.

I have seen many cases of glaucoma-cupping of the optic

disk with atrophy of the nerve well advanced and exhibiting typical so-called "glaucoma fields" with failure of vision amounting to nearly total blindness in which the tonometer registered no increase of ocular tension or at most only a very slight increase. The ratio between the tension and the failing vision is predominantly toward the visual failure. These patients are usually very senile and the prognosis is not improved by any operation.

In another group of cases of apparently the same disease, distinct rise of tension may exist for a long time before there is marked cupping or atrophy of the optic disk. The ratio between the plus tension and the failing vision is predominantly toward the plus tension. These patients are usually not markedly senile and the prognosis is greatly improved by suitable operation.

If you employ a mydriatic in either of these groups of cases you will convince yourselves that the disease is glaucoma indeed, for the pupil remains dilated, the tension becomes distinctly plus, the cornea becomes hazy, slight redness persists and vision is sharply affected—in other words the patient's chronic glaucoma will become acute and the eye will not return to its former state.

In this disease, simple chronic glaucoma, now that we have instruments of precision: ophthalmoscopes, tonometers, perimeters, standardized test types, focal illuminators, trans-illuminators, slit lamps and what-not, the march of the pathological processes and the succession of clinical events become a fascinating study.

As to the cause of this type of glaucoma we are still in profound ignorance. Some knowledge we have to be sure but the real cause or causes are unknown. Dr. Martin H. Fischer of Cincinnati, after lecturing before the Cincinnati Ophthalmological Club at its annual dinner, November, 1922, on the subject of glaucoma, was asked what, in his judgment, was the cause of chronic non-inflammatory glaucoma. His answer was "arteriosclerosis of the nutrient vessels supplying the globe of the eye." He then stated: "Arteriosclerosis is a spotty disease—it occurs in spots. Witness what occurs in the cortex of the brain as a result of arteriosclerosis of the cerebral arteries in the aged. The same process is at work in the blood vessels

of the optic globe in glaucoma simplex. The vasa vasorum become obliterated, the blood vessel walls become thickened, the lumina are reduced in caliber and as a consequence there is not enough blood circulating in the nutrient capillaries of the eye. This results in oxygen starvation and there is produced secondarily an abnormal accumulation of acids which makes the tissues of the eye swell. In consequence of this pressure, sight is destroyed and the optic nerve cupped. Through the rise of intraocular tension the iris is pushed forward and in this way the filtration angle is pressed upon. Obliteration of the filtration angle is therefore not the cause but a *consequence* of glaucoma. Such pressure upon the iris makes for further blood stasis so that a 'vicious circle' is established."

I asked a well-known ocular pathologist (Dr. Francis Lane of Chicago) if he had ever sectioned the optic nerve in glaucoma simplex. He informed me that he had and that there was arteriosclerosis of the central artery. He said there was a typical atheromatous process at work within the vascular system of the optic nerve.

It is without the province of the paper to discuss this subject further. I only mention the thoughts and findings of these two men who have studied the disease further than perhaps any of us.

As for the treatment of chronic non-inflammatory glaucoma, eserine in solution dropped in the conjunctival sac does well for a while but not for an indefinite period of time. Careful tests conducted from time to time in these cases will prove the disease is marching steadily on. We must operate on most of them before it is too late. Knowing that some of the remaining field of vision (at least 5% of the periphery) is apt to be lost after the most successful operation it behooves us to resort to operation before any part of the periphery of the remaining field reaches 20° from the center of fixation. I apply the following rule: use eserine solutions dropped in the eye frequently enough to prevent hyperocular tension so long as there is no further loss of visual acuity or of the field of vision but when eserine drops fail to control the tension, retain the vision and the field of vision in statu quo ante, operate before it is too late.

OPERATIVE TREATMENT OF CHRONIC NON-INFLAMMATORY
GLAUCOMA.

The various operations devised to meet the requirements of these cases are all matters of record and I need not take time to recount them. I shall limit my report to two procedures—one an experimental procedure that resulted in failure, another a modification of two well known procedures which has given, in my hands, better results than either performed alone.

A seton operation: I devised this operation many years ago and reported it in the *Ophthalmic Record* (Chicago). It was performed with the idea of draining the watery fluid contained in the vitreous humor along heavy silk threads passed through the sclera at the equator of the eyeball to cause it to steadily flow out of the vitreous chamber to reach the space of tenon. The current in the lymph space of tenon is constantly flowing backward and it seemed to me that to connect the vitreous chamber with this large lymph channel would not only permanently reduced the intraocular tension but would better imitate nature's plan of drainage than in causing the flow to occur under the conjunctiva in the anterior segment of the eyeball. Moreover, by this plan that the pupil was left undisturbed and that there would be no scar or wound in the limbus and hence the danger of later infection would be greatly reduced or entirely prevented.

In the case reported in the *Ophthalmic Record* (above referred to) I applied the seton drain in an eye totally blind from glaucoma in which pain was a prominent symptom and it acted well. I determined to use it in a suitable case of glaucoma simplex.

I shall not weary you with a recital of the technic. It was an easy operation to perform. I used two strands of heavy No. 10 plaited white silk thread effectually connecting the vitreous chamber with the space of tenon. The result was strikingly beautiful. The eye bore the silk without any sign of irritation. There was no pain and no intraocular hemorrhage. The tension, which I followed closely, was reduced from 48mm before operation to 24mm afterward (Gradle tonometer) and it remained 24mm or less for a year during which time the vision and the field of vision remained un-

changed. I thought I had made a valuable discovery for ophthalmology. After twelve months the tension slowly began to increase. It became 30mm and 36mm and the field of vision which had remained stationary became further encroached upon. When the tension became 36mm I determined to explore and see why there had been a return of glaucoma. I laid back the conjunctiva and searched for my thread. There was no sign of thread, it had entirely absorbed! I found the healed scars in the sclera but no vestige of thread. My "discovery" was a failure.

A MODIFIED ELLIOT-LAGRANGE OPERATION.

The sclero-corneal trephine operation is open to the objection that there is danger of the trephine hole becoming primarily blocked with shreds of lymph and blood clot thus bringing failure.

The LaGrange operation is technically more difficult to perform than the sclero-corneal trephine operation of Elliot



The author's method of converting an Elliot operation into a LaGrange effect.

but not so apt to be followed by primary closure of the wound because there is a longer opening connecting with the aqueous chamber and a wider field of drainage.

I hit upon the plan of performing a careful trephining of the sclero-cornea, executing the iridectomy through the trephine opening in the usual manner, and then with blunt scissors, the point of one blade entering the trephine opening, making a 3mm cut through the sclero-cornea parallel with the periphery of the cornea to the right, then re-entering the point

of one blade of the scissors in the trephine hole making another *3mm* cut through the sclero-cornea to the left. This technic establishes an *8mm* opening connected with the aqueous chamber with the trephine hole in its middle and all located at the extreme angle of the aqueous chamber: *2mm* for the trephine opening, *3mm* cut to the right and *3mm* cut to the left.

This technic, which in my hands, is simpler and safer than a LaGrange operation seems to accomplish all that this operation when well executed accomplishes. It seems that the trephine hole in the middle cannot close until after the cuts to either side have closed and by that time the stage of acute traumatism has passed and the hole will remain open. Also that the conjunctival flap is not forced up by a round stream of aqueous spurting through the hole but by a flat stream distributed over an *8mm* area.

I have performed this operation upon twenty-one eyes within the past two years with excellent immediate success in all and with only two ultimate failures.

The eyes affected with simple chronic glaucoma that were operated upon in the manner described with successful results continue to show the ravages of the disease checked but unchanged as regards the fundus. As a rule they suffered only slight further loss of visual acuity following the operation. Some later on regained what vision they had before the operation and others never regained what they lost as the result of the operation. The further progress of the disease in these successful cases seems to be arrested. None of the patients upon whom this operation proved successful have used miotic-inducing drops of any kind since the operation and in all nineteen the operated eyes remain soft in tension.

SEROUS TENONITIS COMPLICATED BY BILATERAL PAPILLŒDEMA.

BY DR. G. N. BRAZEAU, MILWAUKEE, WIS.

(With one illustration on Text-Plate XXX.)

PEUCHAGUT clearly established the pathology and symptomatology of tenonitis. If we add the formidable complication of papillœdema to this rarely observed disease, we will have a most unusual condition and one bordering on the unique.

Case History.—Nothing appears in the history of this case which can be construed as having any bearing upon it. The patient, a healthy man, thirty years of age claims that he has always been well previous to this attack. He denies ever having had either ear, nose, or sinus disease and says that his sight has always been very good. Early last November, pain together with an annoying diplopia developed first in the right eye and shortly afterward in the left. By the end of the month both eyes had become so swollen and so painful that he had to give up his work of driving a milk wagon. Pain with consequent loss of sleep caused him to lose thirty pounds in weight.

Physical Examination.—In February, I saw the patient in consultation with Dr. J. B. Hervey. The three symptoms which arrested my attention and which are pathognomonic of tenonitis were:

(1) *Bilateral Exophthalmia.*—The right eye protruded about five millimeters beyond the orbital margins and the left about ten millimeters. Both eyes were fixed and directed straight ahead.

(2) *Ophthalmoplegia Externa.*—The eyes appeared as though frozen in their sockets. Their immobility was complete. The intraocular muscles remained intact throughout the course of the disease.

(3) *Chemosis*.—The chemosis in the left eye extruded itself between the swollen lids as a deep red edematous mass about ten millimeters in thickness while the chemosis in the left eye was confined to a mere puffiness of the conjunctiva. The ptosis of both lids was due to the oedema. There were no secretions from the conjunctivæ. Slight lachrymation was present.

An examination of the fundi revealed marked venous congestion with a thinning of the arteries. Both nerve-heads were swollen and their margins were obscured in the mass of infiltration. The swelling in the nerve head on the left side equalled about four diopters while that on the right about one diopter. The fundi were otherwise normal. The vision was $\frac{3}{8}$. The conjunctivæ were slightly red due to passive congestion. All ear, nose and sinus diseases were eliminated by ocular and Roentgenologic examinations of the head and face. The sphenoidal fissures were blurred. Examinations of the blood and urine were negative. Reflexes were normal.

The principal complaint made by the patient was about the pain which, he said, was driving him almost crazy.

Diagnosis.—Two conditions immediately suggested themselves to me viz. tenonitis and orbital phlegmon. A differential diagnosis between these two conditions is sometimes very difficult. Phlegmon was eliminated for the following reasons: the absence of all signs of suppurative inflammation, the lack of pain and tenderness on pressure, the absence of discoloration of the lids, and the fact that a phlegmon is usually unilateral and that its origin can usually be traced to some source of infection. Orbital tumor is likewise generally unilateral and the tendency is for it to displace the eyeball in the direction of its growth. The development is very slow. The presence of papilloedema led to a belief in the possible existence of a brain tumor since it is, in the great majority of the cases, the cause. Out of two hundred cases of papilloedema, one hundred thirty-four were found to be due to cerebral tumors (Kampherstein). Therefore, the rôle played by such other general causes as dyscrasias, intoxications, etc., is minimal. A tumor was excluded for want of motor and sensory disturbances. The diagnosis resolved itself into a probable tenonitis of endogenous origin with papilloedema as a complication. Subsequent events proved the correctness of this diagnosis.

Ætiology and Pathology.—Rheumatism and gonorrhea are by far the commonest causes of tenonitis. Rheumatism proved to be the ætiological factor in this case. But, was it also the cause of the papilloedema? Most of the cases reported in ophthalmic literature on optic nerve involvement

ILLUSTRATING DR. G. N. BRAZEAU'S ARTICLE ON "SEROUS TENONITIS
COMPLICATED BY BILATERAL PAPILLOEDEMA."



A case of tenonitis.

in tenonitis showed, by visual disturbances in varying degrees, that the inflammatory process must have invaded the optic nerves directly. In these cases rheumatism was not prominent as the cause because of its frequency. This is understandable, since rheumatism is not known as directly attacking the optic nerves. The absence of all visual troubles, in this case, tends to prove that the papilloedema was most probably due to pressure on the optic nerves from fluid in the capsule of Tenon. Graefe's mechanical theory regarding the production of papilloedema receives confirmation here. Rheumatism acts upon Tenon's capsule as it does upon the para-articular bursæ because these structures histologically resemble each other. Because of the violent nature of its symptoms and the presence of papilloedema with rheumatism as its very uncommon cause, this case of tenonitis needs must be classified as a very rare form of the disease. The splendid condition of the patient served as my mentor and made it possible for me to offer a favorable prognosis at a time when surgical interference was urged as the only hope of relieving the threatened optic nerves.

Prognosis.—The prognosis in tenonitis is ordinarily good. Violent cases like this one may arouse great apprehension in the minds of both the patient and the physician alike. Papilloedema impels us to great reserve regarding the prognosis both as to life and its effects upon the vision.

Treatment.—Ten grains of salicylate of soda with five of aspirin were prescribed three times a day. The pain ceased after the second dose. After five or six weeks of treatment, the movements of the eyelids were restored by the disappearance of the fluid in them which had, up to this time, resulted in complete ptosis. The chemosis together with the exorbitism also disappeared with the result that the eyes returned to their original positions in the sockets. The patient returned to work greatly improved. The ocular movements were normal in every direction excepting when the patient looked upward and outward. There remained a paralysis of the inferior oblique muscle in the left eye which caused the eye to turn slightly inward and downward with a resulting homonymous, vertical and horizontal diplopia which the patient learned to avoid by slightly turning the head. This is improving and the probabilities are, that the paralysis will entirely disappear in time as the double images are coming closer and closer together and therefore less annoying. This remaining paralysis of the inferior oblique adds another interesting feature to this already anomalous condition because such isolated paralysis is very rare indeed.

A NEW TECHNIQUE FOR THE APPLICATION OF THE REDUCED SILVER NITRATE METHOD OF CAJAL TO SECTIONS OF THE RETINA.¹

BY DR. FELIX FERNANDEZ BALBUENA, GIJON, SPAIN.

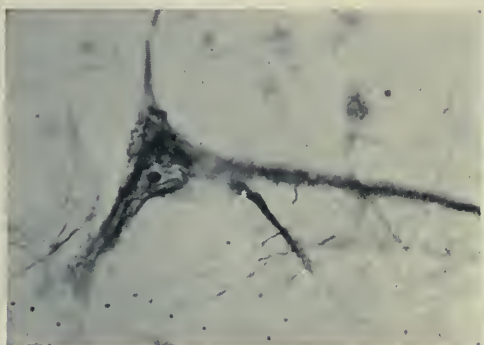
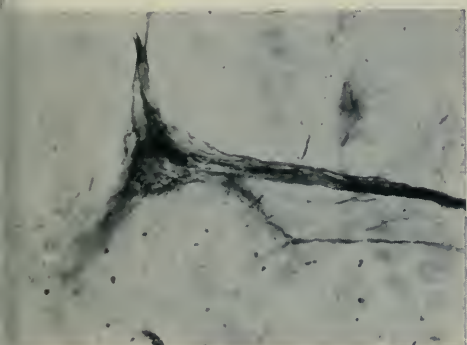
(With seven illustrations on Text-Plates XXXI. and XXXII.)

AN analytical study of the method invented by Simarro: (1) to stain neurofibrils with salts of silver gave to Cajal; (2) the idea of the method universally known as the "Cajal method of reduced silver nitrate." The numerous ways thought of by this author: (3) and the great many new facts discovered by Cajal and his students with the aid of this wonderful method make it one of the most powerful resources and a most efficacious technique as applied to modern histology.

The Cajal method consists, as is well known, in the impregnation of the nervous tissue of the newborn with colloidal silver. By this method the blocks of nervous tissue should be immersed in the silver nitrate solution and kept in incubator at 37° (C.) for a few days. Then it is immersed in a solution of hydro-quinine for 24 hours, finally being put in, or held in celloidin, and we are ready to make the sections. The obtained results vary according to the fixing fluids used, the most common being alcohol 96%, ammon., alcohol, formol, chloral hydrate, pyridin, and others. To practice silver impregnation, and the repeated reduction in block, of the nervous tissue which is being studied has the disadvantage that when the reaction is not obtained we altogether lose the section under study, and for this reason ever since Cajal published his method other authors have tried to apply it to histological

¹ Presented in part at International Congress of Ophthalmology, Washington, May 22d.

ILLUSTRATING DR. FELIX FERNANDEZ BALBUENA'S ARTICLE ON "A NEW TECHNIQUE FOR THE APPLICATION OF THE REDUCED SILVER NITRATE METHOD OF CAJAL TO SECTIONS OF THE RETINA."



FIGS. 1 and 2. Rabbit's retina. Ganglion cells. Neuro-fibrils.

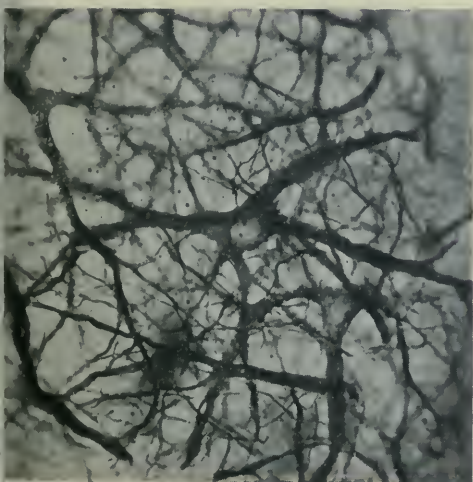


FIG. 3. Rabbit's retina. Large horizontal cells in external plexiform layer.

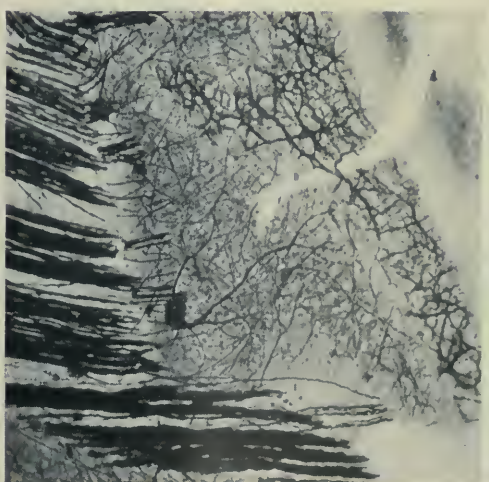


FIG. 4. Rabbit's retina.

sections. Cajal himself, when he first published his technique, made several attempts with this object in view. Liesegang, in his experiments, applied it to gumma and obtained good results; but according to Cajal, Liesegang's procedure gives a very dark background and neurofibril colorizations somewhat coarser and more varied than those obtained by reduction en masse (4). The method of Lugaro (5), which is based on colloidal silver and which is also applicable to tissue sections, according to Cajal gives good results in the retina but is not quite so clear in the nerve centers. Recently Cajal, after abandoning for 15 years his experiments with the nitrate treatment of sections, has resumed his observations and has now arrived at a very easy formula by which he has obtained excellent results, especially in the cerebellum. He explains his reactions by the fact that when the reducer is dissolved in a considerable quantity of formol and acts in weak solutions we are able to prevent superficial metallic deposits, and vigorous selective colorations are obtained.

He employs fixation in formol, sections by freezing, impregnation in 2 per cent. silver nitrate, to which are added a few drops of pyridin. Before the tissue sections are developed, he places them for about $\frac{1}{2}$ minute in 96 per cent. alcohol. Then he finishes with reduction in a weak solution of hydroquinine in formol and distilled water.

He has succeeded in staining in the cerebellum the basket cells and the transverse fibers of the molecular layer, the climbing arborizations of the parallel fibers, and the reticular fibers of the granular layer; in man especially the dendrite branches of Purkinje's cells; in the cerebrum the fine medullated plexus of the gray substance and the fibers or radiating bundles. The pyramids are stained brown.

Regarding the staining of neurofibrils, Cajal notices that sections impregnated from two to six hours in the silver bath do not stain the neurofibrils at all in the cerebellum, and that they are weakly stained in the cerebrum. On the contrary, the terminal arborizations are clearly shown.

In the tissue sections impregnated in cold solutions from one to two days, especially if they have remained for a long time in formol and are obtained from man, there is a selective coloration of the neurofibrils. Cajal notes that with his new

formula occurs something similar to that which takes place in Bielschowsky's method, that is, it only stains the neurofibrillar frame work in the sections that have been subjected for a long time to the action of formol and have remained for a long time in silver nitrate. It is also a characteristic of his formula to impregnate intensely the chromatin of the nervous and neuroglie nuclei and, in some instances, the "casquêtes" of nuclein situated around the nucleus.

When I undertook my experiments to apply reduced silver nitrate to tissue sections, Cajal had not yet published his new formula. The theoretic considerations shown by Cajal in the *Memories of his Life* (vol. ii.), referring to his first method, and the indications contained in the same book about Liesegang's method led me to try different techniques. I am now going to tell every experiment, test, and failure I have undergone. I will review briefly the technique I have employed and the results obtained. But I must say that my work is not yet finished; there are several questions that have to be ascertained from new experiments. Nevertheless, as the preparations of the retina obtained with the technique that I am going to describe have been approved by Cajal, I offer this introductory note as a prologue to a more elaborate work.

TECHNIQUE.

I. *Rolling up of the Retina by Cajal's Method* (7). If we are experimenting on small animals, we leave the retinal block resulting from the rolling-up of the retina, held by the optic nerve to a round segment of the eyeball. This facilitates successive manipulations. Once the specimens are fixed, we totally remove the retinal block. In the large retinas, such as those of the bull or sheep, we make several blocks in order to facilitate the penetration of the fixing fluid. If we wish to study particularly the rods and cones, it is preferable not to remove the retina, but to operate on small fragments of the eyeball. (When we apply the reaction to perpendicular sections of the retina, it is more difficult to follow the reaction than when we work on sections derived from the rolled-up retina, as in the last case the field of observation is much more extensive.)

ILLUSTRATING DR. FELIX FERNANDEZ BALBUENA'S ARTICLE ON "A NEW TECHNIQUE FOR THE APPLICATION OF THE REDUCED SILVER NITRATE METHOD OF CAJAL TO SECTIONS OF THE RETINA."

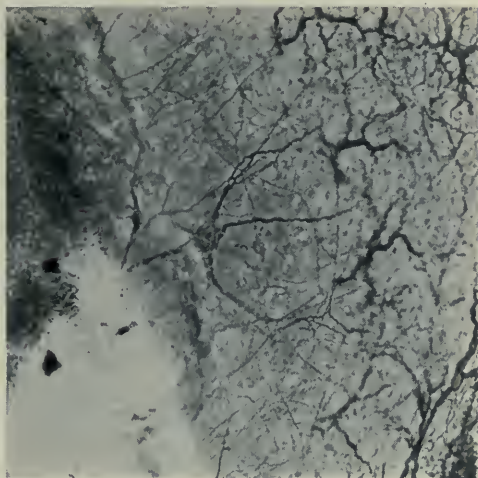


FIG. 5. Rabbit's retina. Ganglia.

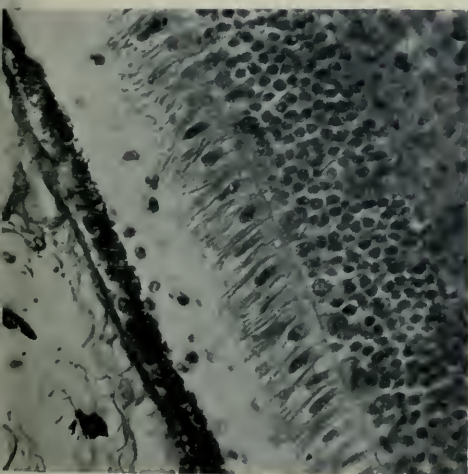


FIG. 6. Human eye. Rods and cones.

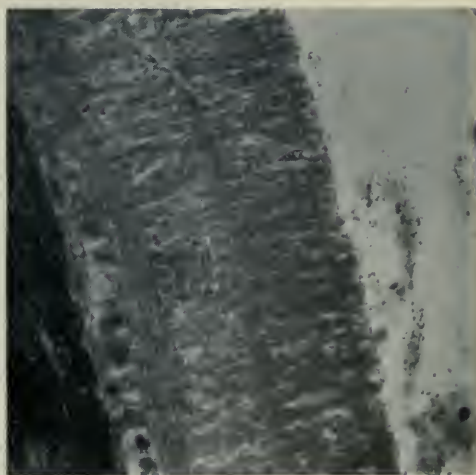


FIG. 7. Human eye. Enucleated for sympathetic ophthalmia.

2. *Fixation of the Retinal Blocks in Absolute Alcohol (50 c. c.) with Pyridin (5 to 10 c. c.) according to Formula 2aB of Cajal.*—

We also use absolute alcohol alone, or ammon. alcohol as in the classical method. The retinal blocks remain in the Fixation fluid 12, 24, or 48 hours, according to the thickness of the specimens. When the specimens are once fixed, they are washed in several changes of absolute alcohol, imbedded in celloidin, and mounted on corks, after which operation they are immersed in 70 per cent. alcohol, whereby is ascertained

3. *The Sensitization of the Specimens.*—The blocks mounted on cork should remain in 70 per cent. alcohol from a few days to two or three months. After four or five days we begin to obtain results. This third operation is usually decisive, and we call it provisionally "sensitization of the retinal block," since it appears that without a more or less prolonged impregnation of the blocks in 70 per cent. alcohol the succeeding operations of nitratization, developing, and virado of the sections will be failures. We suspect that the sensitizing substance is derived from the cork, and is soluble in 70 per cent. alcohol, as we have been able to observe that this alcohol turned yellow after dissolving substances derived from the cork. It seemed to be more efficacious in the sensitization of the specimens. (We point out this observation as being merely accidental.)

4. *Impregnation of the Sections in Silver Nitrate.*—After the retinal blocks have undergone the impregnating process described, sections are made which are grasped with a little paint-brush and deposited on the bottom of a porcelain or glass vessel still moistened with the alcohol which we have used for lubricating the blade of the microtome; then 5c.c. or more of a one per 2000 silver nitrate solution, to which a few drops of pyridin (5 or 10 drops: 20c.c.) have been added, are poured over the sections. In some instances we have used solutions of one per 16.000 and more. When the sections are saturated, we slowly heat the solution until a slight steam rises, whereupon we let the solution cool off. Sometimes it happens that the section does not assume a yellow color as in the case when the conditions are favorable to impregnation. In such cases the solution is heated several times until the yellow color appears. Generally from three to ten minutes of imbedding

in the silver nitrate bath is sufficient, and then we are ready to add the succinum tincture to prepare the colloidal medium.

5. *Preparation of the Colloidal Medium and Developing of the Sections.*—Three or four drops of the tincture of yellow amber added to the silver nitrate bath impart to the solution a colloidal consistency. Afterwards, two or three drops of a one per cent. hydro-quinine solution are added, at the same time shaking the vessel to render the mixture homogeneous. When the reaction is favorable, a gradual deepening of the color of the sections and a clear difference of the various regions is noticed. The time in which the sections remain in the developing fluid varies from four to ten minutes. By watching the effects, we determine when we should stop the process. By a little calculation we easily arrive in each case at the desired result. In some cases it is necessary to assist the reaction by slow heating over the alcohol lamp.

6. *Replacement and Fixation.*—When the sections are developed, they are washed in the same vessel with distilled water. Then we pour on them a one per cent. borax solution and three or four drops of a one per cent. yellow chlorid of gold solution. We finish the process by fixation in a 5 per cent. hyposulphite solution, wash in distilled water, clear in creosote oil of oreganum, and mount in balsam. As may be observed, our technique is based on those of Cajal and Liesegang. But there is a period on which we lay emphasis, and this is the one called *Sensitization of the Block*. We have noticed several times that sections of blocks that had not suffered impregnation in 70 per cent. alcohol did not show a selective reaction producing abundant precipitates, while in sections derived from the same block after its impregnation for several days in 70 per cent. alcohol the reaction was shown very clearly; if it was incomplete, it always began on the borders of the sections.

WITH THE PURPOSE OF INQUIRING WHICH COULD BE THE SENSITIZING SUBSTANCE, I HAVE PERFORMED THE FOLLOWING EXPERIMENTS:

1. Blocks of nervous tissue imbedded in celloidin, immersed in 70 per cent. alcohol for a period of a few days; sections by freezing, impregnated and developed: The result is negative.

2. Tubercle quadrigeminum of the cat, fixed for two days

in absolute alcohol which has acquired a yellow color because of the dissolution of the cork. The sections from this specimen impregnated in silver and developed as described show a selective reaction about the borders and in the neighborhood of the aqueduct of Sylvius; that is to say, in those parts impregnated with 70 per cent. alcohol.

3. Fixation of nervous segments in absolute alcohol with tannin 1 per 1000. The successive impregnations with silver and the developing have been negative (D).

In regard to the fixation fluid used we have adopted the mixture 2B of Cajal, bearing in mind the advantages of the pyridin. This substance was used by Donaggio (9) as a fixing fluid for the purpose of staining neurofibrils. Lugaro and Held have recommended it as a fixing fluid for specimens which are to be stained with reduced silver nitrate (10). Cajal adopted it in his studies concerning neurogenesis and in his investigations about the degeneration and regeneration of the nervous system (11). Bielschowsky uses it also in his modified method (12). As is well known, pyridin helps in the penetration of the silver nitrate and makes it more constant, more regular, and causes a finer precipitation of the silver. Besides, it belongs to the group that Cajal has called *accelerator substances*.

For the preparation of the colloidal medium I have closely followed the ideas of Liesegang. I have also tested several substances, especially tinctures of myrrh, benzoin, and succinum, which have never been used before. In my first test I used silver solutions from 2 to 5 per cent. After several experiments I have adopted solutions of 1 per 2000 and even as weak as 1 per 32,000, and have made use of the tincture of succinum. As a rule, I have begun by using solutions of 1 per 2000, which I have modified according to the circumstances.

I have not yet finished my research. I must still determine by new experiments some peculiarities, but already I am able to show as characteristics of my new technique the following:

1. The possibility of applying silver impregnation to tissues imbedded in celloidin.

2. Activity and rapidity in the staining of the reticula.

While with the known methods of applying silver nitrate to the sections very long impregnations in the silver bath are needed if we wish to stain the neurofibrils, we obtain with my

new technique within three or ten minutes—especially in the retina—a fine, clear, and selective neurofibrillar staining. Sometimes it happens that when the blocks are sensitized (and I employ solutions in large quantities) only the ganglionic fibrils are stained, and the plexiform zones project energetically against the colorless retina. Another feature is the staining of the cones and the external portion of the rods—something which has never been obtained so far with reduced silver nitrate.

Results Obtained.—The best preparations are those of the retina of the rabbit and the human retina. So far I have studied the use of the described technique in four human eyes, enucleated because of sympathetic ophthalmia, in aspegiillar infection, in tumor of the ciliary bodies, and in absolute glaucoma. In all these cases the cones and the external structures of the rods were shown. The foot of the cone appears almost always empty. Without doubt, it is a degenerative phenomenon. The granular chromatin appears finely stained in some of the blocks, but as I am operating with sick retinae the reticulum does not appear, because it has been destroyed. In the retina of the rabbit the large, medium, and small ganglia are well stained. The chromatic spherules of the nucleolus are shown very clearly in some instances. The reticulum of some spongioblasts is also stained, although not quite so clearly. The plexiform zones give sometimes very good preparations.

In the medulla, cerebellum, and cerebrum the obtained results are not quite so good; however, I have some preparations in which I have been able to see very clearly the reticulum and very fine stainings of the chromatin, but the results are here much inferior to those obtained by the classical method.

I also have been able to observe that in the nervous centers the difference in results is due to frequent alterations—in the nervous centers of the rabbit by coccidiosis (13).

Now I simply wish to extend my profound gratitude to Dr. Cajal, who, in spite of the many tasks that rest upon his mind, has had the kindness—for which I never can thank him enough—of examining my work and giving me sound and useful advice. I also wish to thank Drs. Wilmer, Callender, Coupal,

and Bitterman, who have so kindly helped me in presenting my research work.

NOTES.

(A) Dr. Urrea has also published a method of nitration applied to sections based on Cajal's and Liesegang's methods. He prepares the colloid medium adding some drops to an argentic solution of 2 per cent. He makes the impregnation and reduction in the vessel. I have not had an opportunity to confirm the results thus obtained.

(B) I have obtained good reactions on specimens which have remained in 70 per cent. alcohol during five months. In general, in the human retina, with short periods from three to four days of impregnation in this liquid, the consecutive nitration of the sections stain first the cones and the external structures of the rods.

(C) As yet, I have not tried other fixating fluids recommended by Cajal, such as chloral-hydrate, veronal, nicotin, ethylamin, sulfonal, thiosinamin, etc., but I suppose that they will be efficient in the technique I am studying.

(D) If with new tests I could determine which is the hypothetical sensitizing substance, much time could be saved by fixing directly in an alcoholic solution of the said body.

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FURTHER NOTE ON BLEPHAROCHALASIS.

By DR. JONAS S. FRIEDENWALD, BALTIMORE.

IN a recent article,¹ Dr. F. H. Verhoeff and the writer described the pathological findings in a case of blepharochalasis. The outstanding and previously unrecognized feature of the condition which they noted was the widespread proliferation of the endothelium of the capillaries in the cutis. The author wishes to report briefly a second case which has since then presented itself and which fully confirms the previous observations.

CLINICAL.² B. W., colored, farmer, aged 50, reported to the clinic of the Baltimore Eye, Ear and Throat Charity Hospital on September 21, 1922, complaining of scratching of both eyes. Family and personal history disclosed nothing that might have had a bearing on the local condition. He did not know when his lids began to get heavy, but said that they had been so "for a long time." The scratching had bothered him for an indefinite period, with intervals of comparative comfort. Both upper lids were strikingly baggy. There seemed to be twice as much skin surface as is normally present. The skin was soft and pliable, in no way suggesting œdema; its surface was covered with many fine wrinkles. There seemed to be a deficiency of the subcutaneous connective tissue. The excess skin formed a fold which extended a little below the ciliary margin of the lids and covered the upper half of the pupillary areas of the corneas. The cilia of the outer thirds of the upper lids were turned in, so that they constantly rubbed against the corneas

¹ ARCHIVES OF OPHTHALMOLOGY, li., p. 554, 1922.

² The writer is indebted to Dr. H. K. Fleck of Baltimore for the clinical note and the tissue examined.

and produced the irritation for which he was seeking relief. The conjunctivæ of both eyes was quite red. Both corneæ showed areas of opacity that did not stain with fluorescein, undoubtedly the result of the trichiasis. The condition was more marked on the left than on the right. Both palpebral fissures were shorter than normal (blepharophimosis). The pupils and fundi were normal.

On October 6th, under local anæsthesia of 1% novocaine, the excess tissue was removed from the left lid and the trichiasis corrected. The patient was discharged from the hospital twelve days later, his condition having been markedly improved. He promised to return for observation and operation on the right eye, but did not return.

PATHOLOGICAL. The tissue was fixed in formalin, imbedded in paraffine. Sections were stained with hæmatoxylin and eosin, and with Wright's elastic tissue stain. The epithelium was of normal depth, but many of the epithelial cells, especially the basal cells, showed marked vacuolization. Interpapillary epithelial downgrowths were present but less numerous than normally found. Except for the changes in the blood vessels, the cutis and sub-cutis appeared normal. There was no decrease in the elastic tissue. Surrounding almost every capillary, there was a sheath of endothelial proliferation containing many new-formed capillary channels.

The pathological picture of this case fully confirms the findings in the case previously reported.

REPORT OF THE PROCEEDINGS OF THE SECTION
ON OPHTHALMOLOGY OF THE NEW YORK
ACADEMY OF MEDICINE.

By DR. BEN WITT KEY, SECRETARY.

MEETING OF JANUARY 15, 1923. DR. ELLICE M. ALGER, CHAIRMAN.

The program of the evening was confined to a discussion of the subject of "**the eye in sinus infections.**"

Dr. C. W. CUTLER presented a paper on the **general considerations** of the eye in sinus infections, which is published in full on pages 331-344.

Special diagnostic methods employed in this study were outlined by Dr. CONRAD BERENS. A clinical routine for distinguishing abnormalities of the blind spot and the papillo-macular bundle were discussed. Also the blind spot for form, motion, light and colors, and the examination factors which cause variation in its size, were considered. Concluding he stated: (1) Size and location for the blind spot varies with the investigator, dependent upon the method employed and the conditions under which he works; therefore each investigator should establish his own standard of the normal. (2) Various factors influence the limits of even the normal blind spot. Careful ophthalmoscopic study of the papilla and peripapillary area is essential in making a diagnosis of pathologic enlargement of the blind spot. Marked daily fluctuations are looked upon with suspicion. Gradual narrowing of its limits for several days in the absence of other signs, leads one to believe the first or former examinations were perhaps in error. (3) In order that the findings may be correctly interpreted, many factors must be considered which require the careful judgment of the ophthalmologist, if serious mistakes are to be avoided.

Dr. GEORGE S. DIXON spoke on the X-ray diagnosis of cases of sinus infection, and emphasized especially the impossibility, in many instances, of making a definite diagnosis from the plates alone. The reasons for this were numerated and explained in some detail. He pleaded for closer coöperation and study of the plates in person with the rhinologist and the oculist, in order to arrive at the most reasonable conclusion in these cases.

Dr. L. A. COFFIN, in presenting the "rhinological point of view" of sinus infections with ocular complications, said he was especially interested in the first and third cases presented by Dr. Cutler. In the first case he had found no evidence of sinus disease, but stated that such pre-operative lack of evidence does not negative sinus involvement as has been stated by Van der Hoeve. Within the year, the patient had had symptoms of a slight brain hemorrhage, and within three months of the time he had seen her, she had had the grippe with "head stopped up." He instituted treatment for metabolic errors and applied suction to the nose. She improved rapidly until vision was $\frac{3}{8}$. She was dissatisfied because she did not have stereoscopic vision, and intimated that she thought it might have been better had she been operated upon, and that Dr. Cutler was of the same opinion, whereupon Dr. Coffin proceeded to exenterate the ethmoid cells and open the sphenoid. The result was that her vision immediately was reduced to that found at her first visit to him. He has never been able to explain this reduction of vision. While Dr. Cutler thinks the improvement while under the negative pressure may show that sinus disease was present, Dr. Coffin thinks it was due to an improvement in the local circulation of the parts, and more especially is he of this opinion since the autopsy.

He expressed the feeling that thrombo-phlebitis may exist from the ethmoidal to the ophthalmic veins. The nerves may be under pressure from neighborhood swelling of the diseased sinus. Cases spontaneously recover. They recover after operation, also from suction. If what should be comparable to a common denominator in fractions be looked for, Dr. Coffin thought it would be found in the changed circulation of the parts.

The third case of Dr. Cutler interested Dr. Coffin, because he had found many times that cases presenting symptoms pointing to possible sinus disease, which could not be diagnosed from objective findings, recovered entirely when digestion, diet, etc., were carefully corrected.

Dr. Coffin agreed with Dr. Dixon in regard to the unreliability of the X-ray. He not infrequently operated on clinical findings contrary to X-ray findings, and practically always found he had been correct in that judgment. He had had numerous cases referred to him in which the ophthalmologist had reported swellings of from 1 to 6 diopters which had entirely subsided after sinus treatment, or had markedly improved.

DISCUSSION: Dr. E. S. THOMPSON said he was interested in the diagnosing of these cases. Two types of sinus cases cause eye lesions. 1st. The purulent cases—those he had seen were latent ones, there being concealed cells of involvement. The eye frequently showed a cyclitis, a choroiditis or an optic neuritis. Diagnosis is obviously difficult, but when the concealed cells are allowed to drain through evacuation of the area or sinus, the eye condition promptly gets well. The second class of cases—hyperplastic cases—attack the posterior segment. Diagnosis is difficult and must be made by differentiation. The sinus is opened and the eye is relieved. Disease of the bone is the explanation.

Indications for operation are: changes in the blind spots, central scotoma, pallor of the disk, rhinologic examination, X-ray indicative. Dr. Thompson prefers to have the sinus opened without result than to allow the patient to go blind without intra-nasal operation.

He reported a case in which there was color scotoma; vision = $\frac{3}{8}$; optic neuritis; operation and in twenty-four hours thereafter vision = $\frac{3}{8}$. At a later date the same condition returned, vision reduced, optic neuritis; operation and return of $\frac{3}{8}$ vision. For third time this performance was repeated, no pallor of disk and vision returned to $\frac{3}{8}$ for third time. Fourth attack came on while the patient was out West, and vision reduced to $\frac{1}{8}$, fields contracted, and washing out of the sinuses yielded vision of $\frac{3}{8}$. Now at rather frequent intervals the patient has the sinuses irrigated and at this date is free of ocular symptoms.

Dr. FOSTER KENNEDY said that his interest in the relationship of optic nerve injury as a result of sinusitis began in 1907, when a patient, after a minor nasal operation, performed by a general practitioner, became blind in the ipsilateral eye. Her general health after this catastrophe remained good for a year when she died from pneumococcic meningitis of three days' duration; the sphenoidal infection having then burst into the cranial cavity.

Dr. Kennedy discussed the relation of optic neuritis to papilloedema or choked disk; the former being an integral involvement of the nerve with consequent loss of vision. The latter is a mechanical forcing of cerebrospinal fluid into the potential space of the vaginal sheath and its accumulation on the papilla; a process not accompanied by a loss of visual acuity. Following organization, neural compression occurs. In his opinion the number of diopters of swelling at the papilla is no criterion by which to distinguish one process from the other. The processes are completely different, and are to be distinguished by their difference in appearance and different effects on vision, and the widely different visual fields produced in the two conditions.

Dr. Kennedy then discussed cases of retrobulbar neuritis produced by frontal and sub-frontal neoplasms; a local symptom of such growths described by him in 1912. The speaker discussed the different diagnoses of the eye changes in the case of sinusitis and in disseminated sclerosis and encephalitis and aneurysm of the internal carotid artery.

Dr. DUNCAN MACPHERSON referred to two or three features of the subject.

(1) The optic nerve involvements found accompanying intracranial pressure and that found in accessory sinus diseases, are in border line cases so similar that differential diagnosis can not depend on it alone even where choked disks as differentiated from papillitis, etc., are present, because if even a minimum of three diopters is allowed for the definition of a choked disk, that and greater degrees of swelling are found in accessory sinus diseases as well as in intracranial pressure.

(2) Optic nerve oedema has been known in a very few cases to disappear after adenectomy and tonsillectomy. In view of

the number of accessory sinus inflammations clearing after the removal of adenoids and tonsils in children, it is likely that the beneficial effect on the vision, after an adenoid and tonsil operation, is due to the direct action on the sinuses.

The speaker wished to ask of Dr. Berens, what are the indications for blind spot examinations, inasmuch as it is not made as routine in all cases; also whether the data obtained is reliable and whether different chartings are obtained from the same individuals where no cause except that of the patient's individual inaccuracy is known.

Dr. J. J. KING referred to his study of two hundred cases of sinus infection in which the blind spots were enlarged in many of the cases. He reported the case of diplopia in a young girl, whose antrum was badly infected; after opening and irrigating the sinus, diplopia disappeared. The diplopia returned later three times, and was promptly relieved each time by irrigation of the antrum.

The speaker referred to a case of exophthalmos which he had relieved by exenteration of the ethmoid and sphenoid. He also referred to a case of a woman, totally blind in right eye for 24 hours, whose vision returned to $\frac{3}{8}$ after operation; the other eye became totally blind and remained so for some time due to waiting on antiluetic treatment (Wassermann 4+) and without effect; finally operation was performed on the left side and vision rapidly returned to $\frac{3}{8}$.

Dr. W. E. LAMBERT reported the case of a woman with mild œdema of both disks, double retrobulbar neuritis, X-ray negative. Operation, though advised, was not performed; now patient is totally blind, both nerves atrophic. Dr. Lambert believes if operation had been performed, the calamity might have been avoided.

In reply to the question of Dr. Macpherson as to when should examination be made of the blind spot, Dr. Berens stated the following indications:

- (1) When vision can not be improved to normal by correcting lenses in the absence of any evident cause.
- (2) Where history of headache or nasal trouble, chronically inflamed eyelids or conjunctiva, or congested eyes that do not improve rapidly under treatment, and particularly when there is retrobulbar tenderness.

(3) In dacryocystitis or stenosis of the naso-lacrimal duct, with sinus disease as a probable factor.

(4) In glaucoma or suspected glaucoma, and those with inflammation of the deeper structures of the eye, particularly when the optic nerve is involved.

MEETING OF FEBRUARY 19, 1923. DR. ELLICE M. ALGER, CHAIRMAN.

The major part of the evening was confined to the presentation and discussion of cases illustrating the results of the various **ptosis operations**.

Dr. A. E. DAVIS showed three cases of resection of the lid after the Gillet de Grandmont technique. One of these was a case of unilateral congenital ptosis; one a double ptosis, cicatricial, from trachoma; the third, unilateral cicatricial type. Dr. Davis regards this operation as a safe and satisfactory procedure in any form of ptosis; the technique is simple and the degree of correction is definite.

Dr. C. E. McDANNALD reported a case operated upon by Machek method modified by Reese which consists in elevating the lid by lateral flaps of sub-cuticular tissue (including palpebral muscle). These flaps swing the lid upward by a central attachment to the tarsal plate, are drawn upward beneath the deep structures of the brow and are sutured to the frontalis fibers just above the brow line. The result can be determined definitely and is entirely corrective.

Dr. L. W. CRIGLER showed a case illustrating the result of the de Grandmont operation.

Dr. J. M. WHEELER presented a case after the Motais technique. The lid was elevated to the position similar to that of the fellow-eye; the lids closed well; motility was undisturbed; no diplopia.

Dr. N. De L. FLETCHER showed the result of a Motais operation.

Two cases, brothers, operated upon the left eye after the Motais method, were presented by Dr. J. H. DUNNINGTON. Both showed the full corrective result of the operation, with no complication.

Dr. I. GOLDSTEIN presented a case of **congenital ptosis** operated upon according to Motais. The result was gratifying.

Dr. B. W. KEY showed two cases of **congenital ptosis, one unilateral, the other bilateral**, and both complete as shown by photographs, operated upon after the Machek-Reese method. In both cases the superior rectus was affected; in one case there was no motility upward. In each case the lid was suspended to the fullest extent; no diplopia.

DISCUSSION: Dr. J. W. WHITE remarked on the usual complication of partial paralysis of the superior rectus in cases of congenital ptosis, in which type of case the Motais operation is contra-indicated.

Dr. A. WIENER prefers the Motais in cases with normal superior rectus; but where the superior rectus is affected he transplants a strip of fascia which is attached to the lid border, inserted under the brow and fixed into the frontalis tendon. He showed a photograph of a result after operation by the latter method.

Dr. H. W. WOOTTON referred to the resection of the levator (Eversbusch) as being a valuable method in certain forms of ptosis, especially those due to thickening or imperfect action of the levator.

Dr. J. M. WHEELER regards the tarsal resection as indicated in small degrees of ptosis. Motais is the best where the superior rectus is normal, and the operation can be performed at an early age. A suture placed at the margin of the lid and brought upward to the brow, thus reinforcing the position of the lid, is an aid in the Motais operation.

Dr. B. W. KEY described briefly the method of suspending the lid by lateral flaps of superficial fascia and palpebral muscle carried directly through broad channels deeply incised beneath the brow and sutured through the frontalis tendon (after the Machek-Reese technique). The method is suitable in any form of ptosis, especially adapted where the superior rectus is affected. It is simple in procedure and rapidly performed; no scar remains; a lid fold can be secured similar to that of the fellow-eye; elevation of the lid is definitely determined and closure of the lids is complete.

Dr. L. W. CRIGLER referred to a case in which he had performed the Machek operation, with subsequent development of a large sebaceous cyst, which it was necessary to remove.

Dr. L. W. CRIGLER presented a paper, entitled "**A simple**

method of treating congenital dacryocystitis." The condition which predisposes to this "postnatal" infection, is congenital in the sense that there has been a delay in nature's process of canalization of the lacrimal passage-ways. This is manifest in 95% of all cases. He reviewed the embryological development of the naso-lacrimal passage-ways, and pointed out that the nasal opening is the last to form; in many instances it is impervious at birth but canalization may continue until nasal mucosa is reached, or the retained secretions, with the aid of muscular action of the lids, cause the thin partition (wall) to rupture. Where no such favorable termination is achieved, so-called "congenital dacryocystitis," is forthcoming.

The author proposes a method of treatment, which he claims is simple and effective. The tear sac is allowed to become fully distended. The surgeon's thumb is placed over the sac in a way to shut off the return flow through the puncta. This is done by placing the thumb sideways, the nail outward, the sides of the thumb pressed against the puncta; now while maintaining pressure the thumb is rotated in the direction of the nasal duct with abrupt pressure against the distended sac. Thus rupture of the retained membrane in the nasal opening takes place. Only one manipulation of this sort is necessary for a cure. Dr. Crigler has employed it repeatedly over a period of seven years, and without a failure to date.

He reviews the literature of the subject, presenting similar and other methods of treating these cases. In conclusion he advocates the method as safe and effective, and especially adapted for use by the pediatrician, the obstetrician and the general practitioner.

DISCUSSION: Dr. H. W. WOOTTON said the method was a very successful one, and that he had not seen a failure.

Dr. J. E. VIRDEN had employed it and had never seen a failure, except in one case in which there was no entrance of the canal into the nose because of the faulty bone development.

A case of **purpura hemorrhagica** with microscopic demonstration of the eye was presented by Dr. MARTIN COHEN (to be published in the ARCHIVES).

Dr. CYRIL BARNERT presented a case of **tuberculosis of the orbit**, also a case of leucosarcomatosis of the orbit (chloroma) (to be published in the ARCHIVES).

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE (LONDON).

BY MR. H. DICKINSON, LONDON.

A meeting of the Section was held on Friday, March 9th under the presidency of Mr. A. L. WHITEHEAD, of Leeds.

Case of Spring Catarrh.

Mr. CYRIL WALKER (Bristol), brought for diagnosis, the case of a woman aged 37, who presented warty growths on the lids. There was a history of tuberculosis of an elbow extending to 15 years; she had had a series of operations on it, and the sinuses healed two years ago. No disease had been discovered in the lungs. When first seen by Mr. Walker two years ago the warty growths were not so extensive as now. He scraped the nodules, and pathological examination of the material removed showed no evidence of tuberculosis. She was more comfortable after scraping. Sulphate of copper applications seemed to have no influence either way. The fact that a smear revealed marked eosinophilia made him think of spring catarrh, which seemed to be a very uncommon disease in Bristol. He asked as to radium or other radio-active measures.

The PRESIDENT said he would have diagnosed spring catarrh if he had not heard the history, and he would apply radium.

Mr. T. HARRISON BUTLER spoke of three of his cases of spring catarrh which had been treated with radium; two of them did remarkably well, the third not quite so well. He had seen tessellated forms of the disease in the East.

Tumors of Optic Nerve.

Mr. HUMPHREY NEAME read a paper on this subject, supplemented and enforced by an instructive series of slides. It was based upon two cases of the kind he had had under care in the last two years.

The first was that of a boy, who was 14 years of age when first seen. From the age of 8 his mother had noticed that one eye was more prominent than its fellow. It was uncertain from the history whether the proptosis or visual defect was the first to occur. There was a progressive in the proptosis from 1915 until the exhibitor saw him in 1920. The proptosis was a little upwards and inwards. Vision in 1920 was reduced to perception of light. Despite the proptosis, the eye movements remained good. The fundus, disk and macula of the good eye were normal, and vision $\frac{1}{2}$. A nasal examination revealed nothing to account for the proptosis, and a skiagram of the skull did not show any abnormal shadows in the orbital region.

In 1921 Mr. Neame removed the tumor by splitting the external canthus, back to the orbital margin. On blunt dissection, a short piece of optic nerve was found immediately at the back of the eyeball. The tumor was elastic in consistency. The tumor was not completely removed; there was an escape of glairy fluid from the back of the tumor. After the operation, for a few days, there was proptosis caused by hæmorrhage into the orbit; otherwise the after-result was uneventful. Histologically, the optic nerve appeared to be normal. The pial sheath could be traced intact on one side, and almost intact on the other. Outside the pial sheath above there was increased fibrous tissue, and a considerable separation of the dural sheath from the pial; part of the growth had spread through the pial sheath and involved the subdural space.

He referred to Mr. Hudson's paper on this subject, and showed some of the illustrations of it. Mr. Neame discussed the differences between gliomatosis and endothelioma. Of the 118 cases of gliomatosis collected by Mr. Hudson, 70 of the 113 whose sex was stated were in women, 43 in men, and more than 75% of the cases of this condition occurred in the first decade of life. In this condition the visual defect seemed

primary, proptosis being a later development, and eye movements were but little limited. In most of these cases there was either papilloedema or atrophy of the disk. In 50% of the cases removal was incomplete because of extension of the disease into the optic foramen.

The points in the differential diagnosis of endothelioma from gliomatosis were: In the former the age of the patient was greater. In endothelioma exophthalmos generally preceded interference with vision, because the tumor did not primarily invade the nerve, whereas in gliomatosis the nerve was diseased first. Limitation of eye movements was more marked in endothelioma, and there was circulatory obstruction in the lids and conjunctiva. If the media were clear, intraocular extension could be seen.

Mr. TREACHER COLLINS said he found a helpful diagnostic factor was the progressive character of the hypermetropia, owing to the steady growth causing increasing pressure on the back of the globe. He had removed such a growth by the Kronlein operation, and so saved the eyeball. It was best to stitch the lids at the same time, because, the globe being anæsthetic for some time afterwards, there was danger of ulceration. The tumor was cut across at the optic foramen, whence it must have extended into the skull, but no cerebral symptoms resulted, and the child lived many years afterwards, showing that the growth had not a high degree of malignancy. In a future case, instead of a Kronlein he would do the operation Mr. Neame performed in this case; it left less disfigurement. There were three varieties of such growths: gliomatosis, endothelioma, and neuro-fibroma, the differences being due to their originating in different classes of tissue.

Sir JOHN PARSONS objected to the term, in this connection, "neuro-fibromatosis," as it meant an association with nerves. "Fibromatosis" was preferable.

Mr. LESLIE PATON expressed the hope that writers of text-books would cease to use the term "glioma of the retina"; some such name as "neuro-epithelioma" would be better.

Mr. NEAME, in his reply, said he did stitch the lids, and he thought that had a great deal to do with saving the eye.

Mr. WILLIAMSON-NOBLE read a paper on "**Orbital Endothelioma.**" He said he had seen two cases of the condition during the last two years.

The first case was that of a girl, aged 15, who was seen by Mr. Levy 12 months ago. The history was, advancement of the right internal rectus, tenotomy of right external rectus in 1913. There was proptosis of the right eye for two months. The movement out and down was very limited, and slightly limited in the upward and inward directions. The pupil was inactive, the disk somewhat pale, and the vision was reduced to perception of fingers at a distance of 4 feet. The eye was enucleated, and the growth removed piecemeal. When portions of the growth were embedded in paraffin, the structure resembled that of carcinoma of the breast. The slide exhibited showed a large amount of fibrous tissue, enclosing spaces containing numbers of large endothelial cells, with round nuclei. The cells showed a tendency to form spaces, a characteristic of endotheliomata; there was also a marked tendency to the formation of whorls. In the large whorls, those which had existed longest, the cells had undergone complete degeneration, showing as a plaque of fibrous tissue. These features brought the tumor into the endothelioma category. This tumor closely invested the optic nerve, and pressed upon it, causing vacuolation of it, as shown in the slide. The tumor seemed to have arisen from the endotheliomatous cells wrapped round the strands of the pia arachnoid.

High magnification showed definite continuity between the endothelioma cells and the endothelial cells on the inner surface of the dura. Still, this appearance might be produced by infiltration from without.

The second case was that of an orbital tumor in a boy aged $3\frac{1}{2}$ years, and he also was under the care of Mr. Levy. There were chemosis, dilated inactive pupil, some swelling of the disk, and proptosis in a forward direction. When the eye was enucleated, the orbit was seen to be occupied by a solid mass. There was much swelling of the nerve head; but the physiological pit was still present. The tumor was received in pieces, and at first it seemed to be of a complex nature: some parts contained bone, some showed apparently normal cartilage, and deeply-stained cells occurred in some parts, less in others.

Some bleeding had occurred into its substance. It seemed to arise from the lacrimal gland, but the gland cells appeared normal, and they seemed to have no neoplastic activity. Sections did not seem to reveal any evidences of involvement of the optic nerve in the growth, nor involvement of dura or pia. The diagnosis seemed to be either sarcoma, teratoma or endothelioma. He inclined to regard it as periosteal chondrosarcoma.

Mr. LEVY said the second of the cases lived six months after the operation; death resulted from intracranial extension of the original growth. No post mortem examination was allowed. He thought the growth had extended from the orbit forwards, rather than conversely. He regarded it as an endothelioma.

Mr. M. S. MAYOU spoke of two cases of the kind which he had had under care. One was a child who had proptosis on one side, and a swelling in the temporal region of the same side. The latter the surgeon took for an abscess, and opened it, and there issued grumous material. When Mr. Mayou was called to the case he said there was a tumor behind the eye, which was so badly proptosed that it had to be removed. The child died in about a month. The tumor consisted of very large cells packed together, with practically no fibrous tissue. It was an endothelioma, and probably started in the orbit. It filled the whole middle fossa of the skull, perforating through the temporal bone, and bulging outside the temporal region.

The other case was in a girl aged 21. He removed the tumor, which was attached to the periosteum, and subsequently the whole orbit was cleared out. The section resembled one of scirrhus of breast. Endotheliomata presented a variety of appearances because of the degeneration so liable to take place in them. Clinically, they all seemed to be very malignant.

Mr. R. AFFLECK GREEVES regarded the second case as a mixed tumor; these sometimes contained cartilage, bone, and epithelial structures, and an arrangement like prickle-cell nests. In the orbit they mostly arose from the vicinity of the lacrimal gland, but not from the gland itself. With this latter statement Mr. Treacher Collins agreed, and said a parallel case was that of tumors near the parotid gland.

Mr. B. CRIDLAND (Wolverhampton) spoke of an extensive case of the kind requiring a severe operation, which was per-

formed by the late Sir Victor Horsley. The boy lived six months after the operation. Mr. Cridland thought that unless the ophthalmic surgeon was prepared to go on and do a large operation, he ought to hold his hand in these cases, and let an experienced cranial surgeon carry it out.

Mr. LESLIE PATON spoke of a case of the kind which he showed 14 years ago, in which various glands became enlarged, finally those of the mediastinum, and the growth was identical in each. It was a clear case of transference of growth along lymphatics, not along the blood stream.

THE PRESIDENT related a recent case of neuroma of the ciliary nerve, which was at first diagnosed as a tumor of the optic nerve. He exhibited the specimen.

REPORT OF THE ANNUAL CONGRESS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM

BY MR. H. DICKINSON, LONDON.

The Annual Congress of the Society was held on the 26th, 27th and 28th of April, at the Home of the Royal Society of Medicine and (for the clinical meeting) at the London Hospital. The Chair was occupied by the President for the year, Dr. A. MAITLAND RAMSAY, of Glasgow.

The President's Opening Address.

The PRESIDENT delivered his inaugural address, choosing as his subject the debt which general medicine owes to ophthalmology. He said it was easier for most men to trust in authority than to exercise independent judgment, but the trend of modern progress was to appeal less and less to authority. Specialism was the natural sequel of increase in knowledge, and it should be symbolic of the highest form of efficiency. The tissues of the eye were so delicate, its structure so complicated, its diseases so numerous and so frequently followed by disastrous results that it was no matter for wonderment that oculists had existed from time immemorial, though in quite early days their claim to practise the specialty were very poor, as they had not acquired the general principles of medicine and surgery. The specialist in medicine must combine the diagnostic skill of the physician with the dexterity of the surgeon, and add that special knowledge which gave him power to reach further. It should be the aim of every specialist, by reading and frequent visits to a general hospital, to keep in touch with medicine,

at least along its most important lines of advance. But there should be no hurry, as that might lead to specialization too early, to the cultivation of one department to the exclusion of others. The study of ophthalmology, he contended, constituted the best discipline in exact observation in the whole medical curriculum; it was, indeed, an education in itself, for absolute precision was of the first importance. It was a great aid, too, to a methodical investigation of diseases of the nervous system. Such a purely ocular condition as optic atrophy, ocular palsy, or loss of the pupillary light reflex might lead to the diagnosis of tabes dorsalis. One patient he saw had been blind from optic atrophy twenty years before the onset of the more widespread manifestations of disease of the spinal cord. Likewise the study gave decisive evidence of disease of brain or kidneys. Homonymous hemianopsia might be the only proof remaining of a past cerebral hemorrhage, and its recognition where paresis had been slight and transient would prevent the physician falling into error, either in regard to diagnosis or prognosis.

On account of the transparency of its structures, the eye had always been the hunting-ground of the pathologist; pathological changes usually hidden from view could be seen and watched in the eye from day to day.

For some years he had been working with Sir James Mackenzie to whose teaching he owed a great deal of inspiration. He had been struck by the similarity of action of ciliary muscle and cardiac muscle. In both, the limits of muscular capacity must be respected, and the amount of work to be done should be adjusted accordingly. Of all the unstriped muscles in the body, it was only the ciliary muscle and the cardiac muscle which could be forced by the will to continue working long after Nature had called for rest, and the former of these was active all through the waking hours, and the latter was incessant. The reserve power of both became less as age advanced. Loss of power in the eye could be measured and glasses prescribed accordingly; but in the case of the heart which was using up its reserve all that could be done was to limit its work in accordance with its capacity. The power of accommodation could be regarded as a fair index to the general health. In emmetropes who were robust, the need for spec-

tacles could be delayed beyond the usual age, just as the heart of some elderly people permitted them to play strenuous games; but in them the rapid onset of presbyopia was always a sign of failing health, and that the person was not likely to live much longer. Adults often complained of their eyes after influenza, and children often suffered from their eyes for the first time after measles or scarlet fever; in fact sight was quickly affected in all disorders of the body. Inability to use the eyes for close work on account of excessive pain, with hyperalgesia of the skin of the scalp, were symptoms in every way comparable with those present in angina pectoris. The acute symptoms might not be manifest until some hours after the causal effort.

In conclusion, he said the gain to scientific medicine would indeed be great when the ophthalmologist coöperated closely with the family doctor and kept himself informed of the subsequent medical history of patients who had consulted him on account of failing sight, and when, on the other hand, the general practitioner brought his medical knowledge, experience and common sense to bear on all the ophthalmological problems with which he might be confronted in his work.

The Ætiology of Angeoid Streaks in the Fundus Oculi.

Mr. E. TREACHER COLLINS read a paper on this subject. He said a comparison of the arrangement of these streaks in the different recorded cases showed that they presented certain common characteristics, which could only be accounted for by there being some anatomical factor upon which their distribution depended. Their arrangement, he showed, corresponded closely to that of the circle of Zinn of the short posterior ciliary arteries around the optic disk, and of the main branches proceeding from it. Ophthalmoscopic observations by several different writers showed the undoubted hemorrhagic origin of these streaks. The hemorrhages from which they had been seen to arise were never situated in front of the retinal vessels, nor were they flame-shaped like retinal hemorrhages, but presented the characteristics of sub-choroidal or inter-choroidal hemorrhages. Blood effused between the choroid and sclerotic, due to its slow absorption, would, like blood stagnant

in other parts of the body, tend to give rise to insoluble crystals of hæmatoidin and hæmosiderin. These, if deposited in the perivascular spaces around the branches of the short ciliary arteries, would account for their pigmented appearance when viewed ophthalmoscopically.

The other fundus changes commonly met with in association with angeoid streaks, such as haze or pigmentation of the retina, various degrees of atrophy of the choroid, etc., were also, he said, adequately explained as the outcome of sub-choroidal hemorrhage. There was not yet sufficient evidence as to why patients suffering from this affection should have choroidal hemorrhages.

Consecutive Cases of Cataract Extraction by Barraquer's Method.

Mr. R. AFFLECK GREEVES and Mr. R. FOSTER MOORE read separate and independent papers on this subject.

Mr. GREEVES' contribution was based on 49 patients from whom he removed, or attempted to remove, the lenses by Barraquer's method. In two cases he removed the lens from each eye, making the total number of lenses 51. The cases he divided into three groups. In group 1, 31 cases, the lens was successfully extracted in its capsule. In group 2, 7 cases, the capsule broke during the operation, but he was able to extract the greater part of the lens substance with the suction instrument, the capsule left behind being subsequently needled in the usual way. In the third group, 13 cases, the lens could not be delivered by the suction instrument, and the use of the scoop was necessary.

The cases in the second group mostly ran the same course as those after extraction by the old method, and in each case the secondary cataract was needled. In one, needling was a failure, and he proposed to perform iridotomy.

In all the 13 cases in the third group a scoop was used. In the majority, very little vitreous was lost, and on the whole he did not regard the visual results as unsatisfactory. The smallness of the vitreous loss was probably due to the lens being already dislocated forwards. In one case the cataract was hyper-mature and the zonule weak. If a complete iri-

dectomy had been done, the corner of the coloboma might become caught in the edge of the cup and prevent extraction. Another possible reason was the giving way of the lens capsule after the lens was dislocated. A further cause for failure was an unknown variability in the negative pressure obtainable due to the changes in strength of the electrical current which actuated the motor. He entered into the technique of the operation, and gave particulars of each of the 51 lenses treated.

In conclusion, he said his view was that the result of a successful intracapsular extraction by this method left nothing to be desired. The pupil was black and free of membrane, the media were clear, the visual acuity was excellent, and there was no undue amount of astigmatism. On the other hand, however, the method had shown itself to be less certain in its results than extraction without the capsule.

Mr. R. FOSTER MOORE's paper was based on 38 cases; he had excluded 6 in which he operated with an improvised method of producing the vacuum before the Barraquer apparatus was available. Concurrently with doing this operation at Moorfields, he had been, at St. Bartholomew's Hospital and in private, carrying out the extra-capsular method; and this enabled him the better to judge of the respective merits of the procedures. He described a modification of Barraquer's instrument which he had been using; this enabled more delicate manipulation to be carried out, and had no valve which could get out of order. His chief difficulty had arisen from the separation of the cup from the lens when traction had been applied, so that in some cases the instrument had to be re-applied a number of times. Sometimes rupture of the capsule had ensued, sometimes recourse had to be had to the cystotome or scoop. He was sure some of the difficulties had been due to defective suction; in the earlier cases it was not appreciated how poor the suction was. In the latest Barraquer instrument a manometer was incorporated—a great gain.

Of the 38 cases, 22 could be said to have had a quite successful result, the lens being removed entire in its capsule, and there were no difficulties or complications at the time. In 5 others the lens was removed in its capsule, but there was some loss of vitreous. Thus there were 11 cases in which he failed to remove the lens with the instrument, and other means of

doing so had to be resorted to. In 7 cases the lens was expressed after either rupture of the capsule by the instrument, or after cystotomy; and in 4 cases the scoop had to be resorted to. In 9 cases in the series there was loss of vitreous. In one, suppuration occurred and evisceration was performed. In every other case some useful vision at least resulted.

He proceeded to discuss the advantages and disadvantages of the method. Among the advantages was that the whole capsule was removed with the lens, tags of it could not become incarcerated in the incision, and, further, no secondary needling operation was necessary. An important advantage, also, was absence of post-operative iritis. And it was gratifying to see an uniform black pupil after the operation.

The outstanding disadvantage of the method was the frequency of vitreous loss, and its consequences. When such loss occurred he did not doubt that the prognosis, both immediate and remote was worse than when there was no such loss. In 23.7% of his cases there was loss of vitreous. And a very important result was, that the welling of the vitreous into the wound carried the pillars of the iris into the incision, and a deliberate attempt to replace them resulted in further loss. And should any secondary operation be needed in the first day or two, the risk of vitreous again became important. The danger, however, was much minimized by paralyzing the orbicularis with novocaine. In Barraquer's method the lens was drawn out of the eye, not expressed from it; therefore a slight negative pressure was developed within the globe, so that the vitreous tended to suck back rather than to follow the lens, and this might render loss of vitreous more frequent than would otherwise be the case. And in many cases there was need for a complete iridectomy. Altogether, he considered that the operation had in it a considerable element of danger, especially in the matter of vitreous loss, so that for general use it was inferior to the older method. But for immature cataracts and sclerosed lenses the Barraquer method had distinct advantages of its own.

Mr. MALCOLM HEPBURN pointed out that the success of this operation depended largely on an instrument rather than on personal skill. The weight of the instrument, he considered, tended to hamper the necessary delicacy of manipulation.

Mr. LESLIE PATON was not greatly impressed by the instrument.

Col. H. SMITH, I. M. S., said his long experience led him to urge that secondary operations should be deferred until after 10 days. In the intracapsular extraction there was more liability to prolapse of the iris. He could not be sure whether or not the vitreous was renewed in cases in which there had been a loss of it at the cataract operation. He emphasized the great need of thorough control of the orbicularis while the operator was at work.

Mr. KIRKPATRICK also spoke, and the authors replied.

Mr. D. V. GIRI contributed a paper on "**Intracapsular Extraction of Cataract, with a Description of a Simple Technique.**" It was based on 384 cataract operations he did at Bikaner, Rajputana, India. He had to resort to the intracapsular operation because his patients came long distances, were very poor, and time was of great value to them. One patient became so restless after the incision, and rolled his eye so much, that the operation could not be done step by step; hence the operation had to be done speedily, and he therefore expressed the lens in its capsule. Very little pressure was needed, and it came away without mishap. After that, he proceeded to deliberately take out the cataract *in toto*. He described his procedure. The lids were best held apart and controlled by an assistant throughout the operation. For immature and intumescent cataracts the intracapsular was, he said, the operation *par excellence*. If capsulectomy was properly done, the mature hard cataracts shelled out easily as a whole. In a large percentage of mature and hard cataracts the capsulectomy operation gave results which compared favorably with the intracapsular. The worst cataracts to deal with were the hypermature and complicated. The paper entered into every step of the procedure with particular minuteness, and contained a comparison with other procedures.

Disorders of the Blood and their Ophthalmological Manifestations.

A discussion on this subject was held on Friday. Sir HUMPHRY ROLLESTON, in opening the discussion, said that

whereas patients with renal disease, arterio-sclerosis, or affections of the central nervous system might first seek medical advice on account of ocular symptoms, and a diagnosis of underlying general disease might be made from the local changes, such was rarely the case in disorders of the blood. The disorders which he discussed were as follows: erythræmia, pernicious anæmia, subacute combined degeneration of the spinal cord, aplastic anæmia, chlorosis, secondary anæmia (post-hemorrhagic), splenic anæmia of adults and of infants, leukæmia (with chloroma), scurvy, purpura, hæmophilia. The underlying cause of erythræmia was still a matter for further research, possibly it might prove to be a syndrome due to various causes. The frequency of ocular manifestations in it was as yet indeterminate. The visual disorders were variable, and could not be solely explained by the appearance of the fundus. In pernicious anæmia small retinal hemorrhages were usually present; according to Cabot they occurred in over 70%, and they were said to be seen when the red cells fell to 25% of the normal. In subacute combined degeneration of the cord the ocular manifestations were mainly those of anæmia—dimness of vision and pallor of the disk; also slight papilloedema. There might be sluggishness, small size and irregularity of the pupils, and nystagmus owing to degeneration in the cervical cord. Retinal hemorrhages and neuroretinitis might occur in aplastic anæmia. In some of the cases of this now rare disease there was permanent impairment of vision. In severe secondary anæmia, hemorrhages into the retina were very common, and this was probably chiefly due to the underlying toxæmia. In the chronic splenic anæmia of adults he did not know of any special changes in the fundus. In the splenic anæmia of infants (Von Jaksch's anæmia pseudo-leukæmia infantum) retinal hemorrhages probably occurred, but he could not state with what frequency. In Gaucher's disease the conjunctivæ showed a wedge-shaped thickening of brownish-yellow color, with its base to the cornea, first appearing on the nasal side of each eye. Moore described three stages in the retinal changes accompanying leukæmia; (1) engorgement of the vessels, chiefly the veins. (2) The previous engorgement was accompanied by hemorrhages having a central white spot, due to leucocytic accumulation. (3) A general

leucocytic infiltration of the retina and choroid, causing thickening. Contraction of visual fields and night-blindness might also result in this disease. The visual symptoms were not of diagnostic importance in scurvy. Infantile scurvy might show petechiæ of the eyelids. In purpura, flame-shaped hemorrhages into the nerve-fiber layer of the retina were not uncommon, according to Foster Moore. In hæmophilia the retina may be free from hemorrhages.

Sir FREDERICK ANDREWES, F. R. S., spoke on the pathology of disorders of the blood in relation to the eye. Functional disturbances of vision did not need much attention. When through heart failure or thrombosis the blood supply to the retina was cut off or seriously reduced, vision might fail. In ordinary syncope temporary failure of sight might occur without structural change. Yet vision did not appear to fail in even the extreme degrees of pernicious anæmia; only in the post-hemorrhagic form of anæmia did temporary blindness sometimes occur. Yet vision was commonly affected in the converse condition, erythræmia, in which the red cells and the total volume of blood were increased. Visible changes in the fundus took place as vascular alterations in blood conditions, and nowhere could the changes be so well studied. He believed that in chlorosis there was an increase in the fluid elements of the blood, and this was the only form of anæmia in which papilloedema had been observed to occur. He discussed œdema, extravasation of leucocytes, escape of red corpuscles, and leukæmia, remarking that it was possible the retinal hemorrhages in the last-named depended in part on a weakening of the capillary wall from the emigration of leucocytes. He also entered into a minute consideration of the function of the blood platelets.

Dr. A. J. BALLANTYNE said that more than 50% of the cases of anæmia and leukæmia he saw in nine years showed fundus changes of some kind, including alterations of the caliber, course and color of the vessels, œdema of the retina, retinal hemorrhages, and retinal exudates. In simple anæmias there was a tendency to broadening of both arteries and veins, also to an abnormal tortuosity. Pallor of the disks was often visible, but notable pallor of the fundi was exceptional. Hemorrhages were never found in the retina when the hæmo-

globin was higher than 35%. Often the hemorrhages and exudates cleared up when the patient was at rest in bed.

Mr. R. R. JAMES also took part in the discussion. He said he had not seen fundus changes in chlorosis. He detailed the blood picture found in the various classes of cases he had examined during a period of 14 years' hospital observation.

The Bowman Lecture was delivered by Professor GEORGE E. DE SCHWEINITZ (President of the American Medical Association) on **"Certain Ocular Aspects of Pituitary Body Disorders, Mainly Exclusive of the Usual Central and Peripheral Hemipic Field Defects."**

Discussion on "The Diagnostic Significance of Proptosis."

Mr. WILFRED TROTTER introduced this subject. He said diagnosis was still essentially a clinical procedure carried out in the face of experience presented to the medical man unselected and at random. He intended to present in this paper only material which came directly within his own knowledge, restricting his consideration to the grosser forms of proptosis.

A broad division of cases could be made according to whether the eye was displaced antero-posteriorly alone, or whether the antero-posterior projection was combined with some other displacement. The first of these depended on swelling of the orbital tissues from inflammatory conditions or circulatory disturbance, the others, to encroachment upon the orbital space by a swelling—generally a neoplasm—originating within or without it. The general surgeon mostly saw the first group in connection with traumatic orbital hemorrhage, thrombosis of the cavernous sinus, arteriovenous aneurysm within the skull, and Graves' disease. These he considered in detail.

In the second group the cause at work was a swelling originating within or encroaching upon the orbit. The great point to determine was whether or not the cause was a malignant tumor. It usually was so when the eye was displaced forward and also in the coronal plane. Such benign conditions, however, as mucocele of the accessory sinuses, exostosis of skull and benign nasal growths, could cause it. Malignant growths could be divided into those invading the orbit according to

their place of origin, into those of ethmoid, sphenoid, and maxillary regions. Growths of the ethmoid and maxillary regions produced marked and early displacement in the coronal plane, growths of the sphenoid region tended to produce a downward and lateral displacement, at a later stage. All these forms of malignant disease were of insidious onset, and often when their true nature was recognized they were beyond the hopeful reach of surgery. Growths of the ethmoid region were usually recognized by the rhinologist, in whose domain they came. Sometimes their course could be definitely delayed by operations which, at the time, appeared to be very unpromising. Growths in the sphenoidal region presented the greatest difficulties in early diagnosis; they were usually endotheliomata or sarcomata of the periosteal type. Sometimes they might be slowly developing for several years before causing unmistakable symptoms. He related a very interesting and instructive case.

Mr. J. H. FISHER devoted his contribution to a general review of the subject. The term "proptosis" directed attention to something retro-ocular which was propelling the eye forward, or, more correctly, a falling forward of the eye because it was imperfectly restrained in its orbit by muscles. The prominent eyes of very obese persons occasionally brought them within the title, and he had had to perform tarsorrhaphy for this condition; this possibility should be kept in mind in diagnosis. Foster Moore had found fat in the orbit in Graves' disease to be in an abnormal condition; but Treacher Collins considered that Müller's muscle caused the condition, regarding it as the analogue of the "protrusio bulbi" muscle of lower animals. The proptosis in Graves' disease was not always symmetrical, nor of synchronous onset in both eyes. In both this disease and orbital tumors X-rays were often of but little value. As removal of optic nerve tumor, whether with or without resection of the outer orbital wall, rarely left a passable cosmetic result, he strongly advised removal of the blind eye with the growth in every instance. Traumatic exophthalmia would depend on the presence of a foreign body lodged in the orbit, or the pressure of extravasated blood, or infiltration of the tissues with air through the fractured walls of the orbit from the nose or some of its accessory sinuses.

Hemorrhage into the orbit might occur without accident, such as in children suffering from whooping cough or scurvy, in hæmophilics, and in later years of life attributable to arteriosclerosis. Cysts following hemorrhage had been described. Congenital dermoid was the most frequent cyst of the orbit; others included hydatid and cysticercus, but these could only be proved by examination after operation. Cellulitis and infective osteitis of the orbit were easy to diagnose. In all cases of proptosis with inflammatory manifestations examination should be made for paralysis of any of the nerves running in the floor or outer wall of the cavernous sinus. Vascular tumors of the orbit with proptosis must be differentiated into pulsatile and non-pulsatile, the latter being mostly cavernous angiomas. He advocated association with the neurologist in dealing with intracranial causes of proptosis; these he dealt with *seriatim*. Similarly, in cases of extension of growths from the accessory sinuses of the nose, the assistance of the rhinologist might be needed in dealing with the septic conditions in those cavities. The rhinologist invoked the aid of the radiologist, but both together often gave the ophthalmologist less assistance than he needed.

Dr. ANGUS MACGILLIVRAY followed Mr. Fisher. He said the apex of the cornea was between 12 and 14mm in front of the temporal margin of the bony orbits; when readings of over 14mm were taken, exophthalmos was present, when under 12mm enophthalmos. The routine use of the exophthalmometer was desirable. Proptosis due to increase in the orbital contents was the result of certain inflammatory, pathological, or traumatic conditions originating in the orbital cavity, such as periostitis, cellulitis, neoplasms, vascular derangements, and thickening of orbital walls. These were the main conditions causing proptosis which the ophthalmic surgeon was likely to be called upon to treat. He divided proptosis, for diagnostic purposes, into (a) bilateral and (b) unilateral, the first being much the smaller division. He discussed them at length, and said, in conclusion, that after 28 years of experience in the ophthalmic department of a large general hospital, he and his colleagues had come to regard proptosis as a danger-signal, and the help of colleagues in other departments was sought without delay in arriving at a cause.

Mr. P. G. DOYNE also read a contribution on the subject.

Mr. ROPER, Mr. JOHNSON TAYLOR, Mr. HARRISON BUTLER, Mr. MAYOU, Mr. TRAQUAIR, Mr. INGLIS POLLOCK, Mr. BEATSON HIRD, Mr. HEALEY, Mr. B. CRIDLAND, Mr. GREEN (Norwich), and Mr. R. FOSTER MOORE took part in the discussion, and the openers replied.

Mr. W. T. HOLMES SPICER read a paper on "**Secondary Corneal Opacities.**"

Mr. F. A. WILLIAMSON-NOBLE read a paper on "**Macular Changes Associated With Thrombosis of the Central Retinal Vein.**" He described the appearances in four cases. These are indicated in the following details of the first case. The sight of the patient, who was aged 27, had been failing 18 months before excision of the eye. There was old interstitial keratitis, the cornea being opaque and ectatic. He showed micro-photographs of the sections cut at different angles. It showed the usual picture in venous thrombosis, and the thrombosis had occurred in the region of the lamina. Sections of the half-eye showed vascularization of the middle and deeper layers of the cornea, and hemorrhage in the nerve fiber layer of the retina. There was slight œdema in the external molecular layer of the macular and perimacular region. He concluded (1) that in cases of thrombosis of the central retinal vein, a varying degree of œdema developed in the region surrounding the fovea, causing damage to retinal structures here. (2) That if œdema were of old standing or large in amount, some of the fluid percolated through the sub-retinal space, caused detachment of retina in the macular region, bringing about its degeneration.

Members attended the London Hospital on Friday afternoon, where a series of cases were inspected and discussed.

On Friday evening, a number of papers were read. One was contributed by Mr. F. A. ROSS and Dr. SHEPHEARD-WALWYN on "**A Case of Mikulicz's Disease.**" It was illustrated by photographs. The patient was a married woman, aged 37. The bulging below the eyebrow was found to be due to a finely-nodular enlarged lacrimal gland. There were the usual symptoms and physical characteristics of the disease. The urine was normal, and the Wassermann negative. Immediately preceding death she had air-hunger, cyanosis, and

oedema of both lungs, the physical cause of death being acute nephritis and uræmia. The tubules of the lacrimal gland, according to Dr. Canti's report, were normal, but were pressed apart by masses of round cells containing a few fibroblasts and fibrous tissue cells. The various treatments tried, and the clinical course were carefully set forth.

Mr. B. T. LANG discussed the subject of "**The Unobstructed Field in Perimetry,**" Mr. JOHN ROWAN presented a paper on "**A Case of Intraocular Tumor, Presenting Some Unusual Features,**" and Mr. G. F. ALEXANDER spoke on "**Measurement of the Diameters of the Cornea and Pupil and the Inter-Pupillary Distance.**"

Mr. ANGUS MACGILLIVRAY read a paper on "**Enucleation of the Eyeball Under Local Anæsthesia.**" He pointed out that the services of the expert anæsthetist were not always available, and in his absence the administration might be indifferent. In the search for a suitable local anæsthetic, a 2% novocaine solution was fixed upon, owing to its comparatively low toxic properties, and in practice their confidence in it had increased. The solution consisted as follows:

Novocaine 10 grs.; sodii chlorid 2 grs., Potass. sulph. $1\frac{1}{2}$ gr.; Aq. distill 1 $\frac{1}{2}$. It should be kept in a stoppered bottle, and could be sterilized more than once without deterioration if adrenalin were not added. He described the procedure in detail. It was not necessary to prepare the patient as for general anæsthesia. To neurotic or frightened patients, two 5 gr. doses of veronal were given the previous day, *i.e.*, at 5 and 10 P.M. The method could be easily adapted to all forms of extraocular operations. He believed that when once the details of the method of securing local anæsthesia had been properly grasped, it would become the routine, general anæsthetics being reserved for young children.

Mr. BASIL GRAVES (who is Lang Clinical Research Scholar at Moorfields, and Pathological Curator at the Royal Westminster Ophthalmic Hospital) read a thoughtful paper on "**Microscopy of the Living Eye.**" He described, with the aid of diagrams projected with the epidiascope, the main principles of illumination of the eye, and discussed the selection of a suitable nomenclature for certain conceptions which, arising out of this new work, at present lack suitable definitive terms.

He felt that a vague, equivocal or unjustified use of certain terms is creeping into the English-written literature of this subject. Such terms as diffraction, fluorescence, scattering, internal refraction have a very precise significance in the nomenclature of the physics of light, and he suggested that for the present the unsubstantiated appropriation of such terms for various clinical effects is apt to lead to confusion among writers, and is wanting in scientific accuracy. He pointed out that a speculative use of such terms was furthermore unnecessary, because for the moment we are concerned more with the making use of results than with the explaining of their cause. He suggested certain non-committal terms to indicate various effects, which he explained by diagrams, among them the word "relucency" for that property of a transparent living tissue in virtue of which a beam of light traversing it undergoes modification, to be revealed as a manifest illumination of the tissue. He pointed out how in the ordinary method of oblique illumination with a pocket lens and a widespread light source, the view of deeper structures was not clear because of illumination occurring in those transparent tissues which are in the line of observation. As instancing, however, what was possible by means of the ordinary method in the hands of a skilled observer, he quoted the detection of the finer cases of Mr. A. C. Hudson's "brown line" in the cornea.

After referring to the principle of diaphragm-lamps, such as those of Gullstrand, Lemoine and Valois, he demonstrated a hand-torch (not on the diaphragm principle) to give an intense beam 4mm in diameter, for use in clinical inspection of the eye with the pocket loupe, or in such operations as needling, with the aid of which the operator could clearly see the membrane to be needled by observation through tissue whose transparency is not impaired by aberrant rays of light. He illustrated the four main headings under which could be grouped the methods of illumination for microscopy of the eye, and as a substitute for vague and multiple terms at present in use for three of these, he suggested the adoption of terms which he is accustomed to use in his own notes: "Direct-illumination," "Retro-illumination," "Proximal-illumination." The fourth method, elaborated by Professor Vogt, he designated "Specular

reflection." He then gave, by diagram, examples of the manner in which different physical conditions could operate in these main methods.

He went on to discuss the Zeiss binocular microscope, an instrument which has been made in its present highly efficient form for many years. He suggested that this instrument had not previously been adopted more generally by ophthalmologists chiefly for two reasons: (1) its scope would have been better indicated if it had been named the binocular eye microscope instead of the corneal microscope; and it had always been provided with an attached automatically registering illuminator which lacks sufficient intensity in its light source, and whose optical design is unsound for the purpose required of it, because it yields a beam of light very wide in diameter. He had no wish to detract from the great value of a special focal illuminator such as the slit-lamp; but as a preliminary or adjunct to the use of this, some illuminator attached to the microscope, giving a wider yet still restricted beam, and in automatic registration with the focussing of the microscope, was, he contended, very desirable in routine work on microscopy of the eye. He described how possessors of the Zeiss eye microscope can themselves, at a very small cost, alter the optical system of the illuminator, so that it will yield an intense focal illumination of about 4 to 5 millimeters in diameter. With this it is possible to get a very clear view under high power of the blood corpuscles moving in the corneal channels of an old case of interstitial keratitis. In more advanced work, e.g. in Vogt's method of using the slit-lamp by observing the endothelial corneal surface by reflection, in which only a very small area is illuminated and the visual background is dark, Mr. Graves prefers on occasions to facilitate the location of certain features by illuminating the background with light introduced from such an additional second source. He pointed out that the Lucanus quadrant was better than the alternative Gullstrand semi-circular rail as a mount for this illuminator, because it so happens that the pivoting of the illuminator to the quadrant by a movable joint enables the focussed light to be swung at will to and fro across the field of observation. This, with the alterations described, gives excellent facility for quick, simple inspection of the eye under circumscribed focal

illumination, without a veiling of the view of structures on a deeper plane resulting from illumination of those more superficial tissues through which observation must be made.

The reader of the paper urged the adoption of so-called microscopy of the eye in routine practice, as being an easy and precise means of fine observation. He added that if the principles sounded somewhat complicated, they were not so in practice, and he offered to show, at the Moorfields Eye Hospital, the application of the various apparatus.

There were also read the following: Mr. HUMPHREY WEANE, **"Results of Further Investigations on the Passage of Arsenic into the Aqueous Humor after Intravenous Injection of Novarsenobenzol in Rabbits,"** Mr. W. B. INGLIS POLLOCK, **"A Case of Pseudo-Glioma,"** and Mr. G. F. ALEXANDER, **"A Theorem Generalizing the Optical Problems of Ophthalmoscopy and Skiascopy."**

A museum of instruments and appliances was held during the Congress in the Royal Society of Medicine's Marcus Beck Laboratory. On Thursday evening, members dined together, and the Congress was in every way an unqualified success.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by DRs. A. N. ALLING, New Haven; M. J. SCHOENBERG, New York; T. H. BUTLER, London; P. G. DOYNE, London; and K. WESSELY (*Archiv für Augenheilkunde*), Würzburg.

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(Continued from the May issue.)

VIII. THE ORBITS AND ACCESSORY SINUSES.

55. EICKEN. Accessory sinuses and diseases of the optic nerve. *Zentralbl. d. ges. Ophthalm.*, iv., p. 49.

56. ERGGELET. Bone tumor of the left orbit. *Münch. med. Wochenschrift*.

57. HUBER. A case of inflammatory pseudotumor of the orbit. *Klin. Monatsbl. f. Augenheilkunde*, lxx., p. 718.

58. SCHAEFFER, J. P. The visual pathway and the paranasal sinuses. *American Journal of Ophthalmology*, February, 1922.

ERGGELET (56, **Bony tumor of the orbit**) describes a case of exophthalmos forward and downward in which a smooth tumor as hard as bone could be felt in the upper inner part of the orbit. The mobility of the eyeball is said to have been normal. The X-ray showed a shadow in the region of the ethmoid cells and sphenoid with an extension toward the temporal margin of the roof of the orbit. The vision was good, the papilla somewhat pale. Wassermann negative. Diagnosis: osteoma of the ethmoid cells. Confirmed by operation. Uneventful recovery.

HUBER (57, **Inflammatory pseudotumor of the orbit**) reports the following case. A man 20 years old, a prisoner for eleven months, was suddenly seized with blindness and severe pain in his left eye. Examination showed amaurosis of the

left eye, which protruded outward and downward with paresis of the extrinsic muscles. The orbicularis was intact. The ophthalmoscope revealed a marked choked disk, no hemorrhages, and a slight peripapillary oedema. The patient had tuberculosis. Wassermann, X-ray, and nasal examinations gave negative results. No benefit from potassic iodide. The presence of a sarcoma was suspected, so the orbit was exenterated. Microscopic examination revealed a chronic retrobulbar inflammation. Plasma cells and lymphocytes, the latter frequently as lymph follicles, were found in the connective tissue of the orbit, which was poor in vessels and cells. The musculature was swollen with hyalin. The connective tissue between the muscle fibers was increased and contained little infiltrates of lymphocytes and plasma cells. The papilla and choroid were oedematous. Seven weeks after the exenteration the patient complained of headache on the right side. The right eye showed a hyperæmia of the papilla, and a difference of refraction between the papilla and macula of four diopters. Vision good. Energetic treatment with mercury and iodide was instituted and the condition did not grow worse. Further course unknown.

EICKEN (55, **Accessory sinuses and diseases of the optic nerve**) criticizes sharply the enthusiasm for endonasal treatment of the accessory sinuses for diseases of the optic nerve. A review of the literature shows that the diagnosis of rhinogenous retrobulbar neuritis is frequently made from very different bases. To all appearance many cases have been ascribed to a rhinogenous origin when improvement has followed an endonasal intervention although no pathological findings could be demonstrated. There have been cases in which the patients operated on later developed a multiple sclerosis as the cause of the disease. Taking into account the uncertainty of the diagnosis Eicken thinks the rhinologist not justified in performing an operation at the request of the ophthalmologist. The views of rhinologists vary concerning the effect of endonasal treatment upon such neuritis. Many cases are cured by slight interventions, like the application of cocaine. Cleansing of the antrum often brings betterment. Others recover after slight operations on the turbinates. Numerous cases are reported in which the opening of the posterior ethmoid and the sphenoid

cells was effective. Very often no pathological condition was revealed by these operations. Because of the lack of pathological studies we are still far from a correct knowledge of all the ætiological factors.

SCHAEFFER'S (58, **The visual pathway and the paranasal sinuses**) interesting paper is the result of a careful study of the relation of the optic nerve and chiasm to the posterior ethmoid and the sphenoid sinuses. One is struck by the fact that a very great variation exists in different skulls and also between the two sides of the same specimen. As a rule it may be said that the optic nerve is in close relation to the sinuses for about 21mm to 26mm of its length, and in many cases the contact is so close that the optic canal forms a mound in the wall of the sinus; as the bony walls of the ethmoid and sphenoid sinuses are extremely thin, and sometimes even absent, so that only the mucous membrane intervenes, it is not strange that disease of the sinuses should be communicated to the nerve. The ostium of the sphenoid sinus is situated at some height above the floor, and this is sometimes true of the ethmoid, so that drainage is not easily effected, thus adding to the dangers. The optic nerve within the orbit is for the most part separated from the sinuses by orbital fat, and the optic commissure may be protected from the ethmoidal sinus either by thick walls or by the hypophysis, so that these portions of the optic tract are less liable to involvement. The infection may be carried either through the lymph channels or through the blood. ALLING.

IX.—THE CONJUNCTIVA.

59. BLATT. Clinical and experimental studies of parenteral milk injections in trachoma. *Klin. Monatsbl. f. Augenheilkunde*, lxv., p. 668.

60. BRAUNSCHWEIG. Formation of folds in the conjunctiva bulbi. *Ibid.*, lxvi., p. 123.

61. CORDS. Treatment of vernal conjunctivitis. *Ibid.*, lxvi., p. 470.

62. GUIST. A case of Recklinghausen's disease with involvement of the lids and bulbar conjunctiva. *Ibid.*, lxv., p. 850.

63. KIEHLE, F. A. Phlegmon of the conjunctiva following operation. *American Journal of Ophthalmology*, December, 1921.

64. KUBIK. Spirochætal conjunctivitis in infants with congenital syphilis. *Klin. Monatsbl. f. Augenheilkunde*, lxvi., p. 69.

65. LINDNER. An endemic of 56 cases of gonorrheal conjunctivitis. *Ibid.*, lxv., p. 637.

66. SCHREIBER. Formation of folds of the bulbar conjunctiva and its relation to blepharochalasis. *Ibid.*, lxvi., p. 440.

LINDNER (65, **Endemic of gonorrheal conjunctivitis**) reports a peculiar endemic of gonorrheal conjunctivitis which occurred during the war, by which fifty-six soldiers were laid up. Only two of them had a subacute urethral gonorrhea. The source of infection was finally traced to the soiled fingers of an attendant, who everted the lids for the routine inspection of the eyes.

BLATT (59, **Parenteral milk injections in trachoma**) studied the effects of this treatment on 150 patients with trachoma, divided into groups of 50 each. In the first group milk injections alone were employed; the results were 22 worse, 28 unchanged, no case of improvement. In the second group local treatment was combined with milk injections; the results were 3 worse, 16 unchanged, 31 improved. In the third group local treatment alone was employed and no milk injections given; the results were 4 worse, 12 unchanged, 34 improved.

Although fibroma of the lids has been frequently observed as a concomitant with a general fibromatosis, such an involvement of both the lid and the bulbar conjunctiva is rare, and this makes the case of Recklinghausen's disease reported by GUIST (62, **Recklinghausen's disease with involvement of the lids and bulbar conjunctiva**) worthy of note. The patient was a woman 45 years old, who had noticed for twenty-one years that isolated wartlike bodies were scattered all over her body, and that these gradually grew larger. Together with these cutaneous fibromata and a partial hypertrophy of the left side of the face, the disease affected the conjunctivæ of both eyes and there was a neurofibroma at the limbus of the right eye.

KIEHLE (63, **Phlegmon of the conjunctiva following operation**) records an unfortunate experience after an operation for pterygium. The site of the wound on the following day was transformed into a slough which rapidly spread about the cornea in spite of vigorous treatment and the eye was lost through corneal ulceration and irido-cyclitis. The eye was enucleated but the infection persisted in the orbit which continued to discharge pus for a number of days. The organisms found were streptococcus and staphylococcus but they were of low pathogenicity for animals. The operation was performed in the hospital and the usual operative technic was employed so that the means through which infection was introduced could not be determined.

ALLING.

KUBIK'S (64, **Spirochætal conjunctivitis in infants with congenital syphilis**) patient was a baby 7 weeks old, suffering from a severe form of congenital syphilis marked by great emaciation, pemphigus syphiliticus, coryza syphilitica, rhagades at the angles of the mouth and lids, and syphilitic changes in the mucous membrane of the mouth. Although there were no papular or gummatous processes in the conjunctiva, spirochætæ could be obtained from the epithelium of the infiltrated tarsal conjunctiva. As they could regularly be found after a thorough cleansing, it is not probable that they came from the rhagades at the canthus.

CORDS (61, **Treatment of vernal conjunctivitis**) saw an apparently complete objective and subjective cure follow in a few days after an injection of afenil, a solution containing 11.42% chloride of calcium and 68.28% urea. The patient, a woman 21 years old, had suffered for two years from a typical pericorneal vernal conjunctivitis which had proved resistant to any tried form of treatment. Cords then recommends afenil for a wonderful number of diseases, and says that aside from a general feeling of warmth, especially in the mouth, no bad effects have been observed. Its use is contraindicated by heart and arterial disease.

BRAUNSCHWEIG (60, **Formation of folds in the conjunctiva**) has observed the formation of folds in the bulbar conjunctiva of four elderly people. In consequence of a loss of elasticity through atrophy of the elastic fibers, a narrow lip-like fold of the bulbar conjunctiva may be formed at the edge of the lower lid. In three of these cases the fold was removed through the excision of a crescentic piece of conjunctiva on the outer side of the eyeball and the closure of the wound with sutures.

SCHREIBER (66, **Formation of folds of the bulbar conjunctiva**) reports two cases similar to those described by Braunschweig. He excises the fold itself with a crescentic piece of conjunctiva parallel to the margin of the lower lid. In one of his cases this fold formation was associated with a blepharochalasis, and the similarity of the changes was evident.

X.—THE CORNEA AND SCLERA.

67. BANE, W. C. AND BANE, W. M. **Disciform keratitis.** *American Journal of Ophthalmology*, November, 1921.

68. BEHMANN. Two cases of band-like opacities of the cornea in seeing eyes of young patients. *Klin. Monatsbl. f. Augenheilk.*, lxvi., p. 450.
69. BIRCH-HIRSCHFELD. Injuries of the human eye by the X-rays. *Zeitschrift f. Augenheilkunde*, xlv., p. 199.
70. FREYTAG. Blue sclera and fragility of the bones. *Klin. Monatsbl. f. Augenheilkunde*, lxvi., p. 507.
71. GARRAGHAN, E. F. Papilloma of the cornea. *American Journal of Ophthalmology*, October, 1921.
72. GRADLE, H. S. The present status of keratoplasty. *Ibid.*, December, 1921.
73. KLEIBER. Keratitis bullosa and scleroticans in scleroderma. *Berl. augenärztl. Ges.*, November 25, 1920.
74. KRÄMER. Episcleritis metastica furunculiformis. *Klin. Monatsbl. f. Augenheilkunde*, lxvi., p. 441.
75. KÜMMEL. Peculiar injury of the cornea by the X-rays. *Ibid.*, lxvi.
76. KUSAMA. Primary fatty degeneration of the cornea. *Ibid.*, lxvi., p. III.
77. LÜSSI. Thinning of the cornea with and without ectasia. *Ibid.*, lxvi., p. 905.
78. PICK. Blinding of an infant by instillation of wrong solution. *Ibid.*, lxvi., p. 485.
79. SCHNYDER. Studies of the normal and pathological endothelium of the cornea with the Nernst slit lamp. *Ibid.*, lxvi., p. 785.
80. TENNER, A. S. The relief of partial or complete anterior staphyloma. *Journal A. M. A.*, November 26, 1921.

BANE (67, **Disciform keratitis**) relates a typical case of this disease which recovered after three months with a thin central opacity. The various causes which have been suggested are injury, syphilis, small-pox, vaccine virus, tuberculosis (first proposed by Tyson), neuropathic (Verhoeff). None of these seems to apply in this case. The treatment instituted was subconjunctival injections of cinnamat of sodium 2% and 15m doses.

ALLING.

The rare picture of band-like opacities of the cornea usually appears in blind eyes and in the stage of degeneration of glaucoma or of chronic iridochoroiditis. BEHMANN(68, **Band-like opacities of the cornea in seeing eyes of young patients**) states that he has seen within a few months such an opacity in two young patients with seeing eyes. Almost exactly the same clinical picture was present in both patients. In both the bilateral opacity was ascribed to an antecedent iridocyclitis with circular posterior synechiæ. Neither patient showed any sign of

tuberculosis or of hereditary syphilis, but the general condition of each was not good, said to be lymphatic asthenic. One patient was treated with atropine and yellow ointment without any visible result, while a double iridectomy in the other, performed for optical purposes, induced a considerable clearing up of the corneal opacity.

KUSAMA (76, **Primary fatty degeneration of the cornea**) observed a case of this nature in a woman 55 years old. He found that the fatty substance consisted mainly of a mixture of cholesterin and fatty acid. Cholesterin is made recognizable in the form of greenish-blue rhombic crystals by the addition of Lugol's solution and sulphuric acid.

BIRCH-HIRSCHFELD (69, **Injuries of the human eye by the X-rays**) has found changes in the vessels of the episcleral tissue, of the iris and retina, and in the epithelium of the cornea. He reports two cases. The first case proves, he claims, that hard, filtered rays can injure the deep layers of the cornea, although this is scarcely to be taken into account when dealing with an intraocular malignant tumor. The second case may be unique in that the application of the rays to an affection of the lid caused blindness and pain in a healthy human eye. The microscopic examination of the eye showed absolute glaucoma with marked changes in the epibulbar and intrabulbar vessels as well as in the cornea. At the limbus the picture closely resembled the epithelial changes seen after frequent irradiations of the conjunctiva with ultraviolet light. The layer of basal cells in the epithelium of the cornea was transformed into flat epithelia with rod shaped nuclei; then came a layer of swollen, blue stained cells of irregular shape, which showed signs of breaking down, while the covering layer consisted of a single layer of flat cells. In other places the corneal epithelium was reduced to a single layer of flat cells. There was an irregular broadening of the layer with conelike proliferation toward the subepithelial tissue of a peculiar, glassy, homogeneous consistence; plasma cells in the subepithelial tissue, vessels narrowed in places, dilated in other places, and frequently recognizable detachment of the intima. A newly formed jellylike granulation tissue extended like a pannus over the margin of the cornea with numerous dilated vessels; finally there was a dense infiltration of the deeper layers of the cornea.

KÜMMEL (75, **Peculiar injury of the cornea by the X-rays**) observed a reduction of the sensitiveness of the cornea after exposure to the X-rays. Whether there was a reduction of the power of resistance of the tissue in addition to the nervous disturbance, was not determined.

GARRAGHAN (71, **Papilloma of the cornea**) describes a large, pinkish, granular tumor which sprang from a pedicle attached to the sclero-corneal junction and covered about four-fifths of the cornea. It had been growing for about a year. It was excised and the base cauterized but there were a number of recurrences which required repeated cauterization. It was composed of epithelia and connective tissue. When last seen it had almost disappeared but the recurrences would suggest malignancy.

ALLING.

PICK (78, **Blinding of an infant by instillation of a wrong solution**) observed a case in which the conjunctivæ and corneæ of an infant had been badly burned, with subsequent perforation of the corneæ, after the usual instillation of drops by a midwife, which were supposed to be a 1% solution of silver nitrate, but were later found to be a 10% solution.

KRÄMER (74, **Episcleritis metastica furunculiformis**) describes under this heading a condition met with in a man 22 years old. The condition appeared in the course of a general staphylomycotic infection. A nodule as large as a hazel nut formed in the episcleral tissue with severe signs of inflammation and with more or less involvement of the sclera. Pus was evacuated which contained great quantities of the staphylococcus pyogenes aureus, the same agent as found in the furuncles elsewhere on the body. Healing took place gradually after the necrotic parts had been thrown off.

FREYTAG (70, **Blue sclera and fragility of the bones**) found eighteen members of one family, covering five generations, of whom eleven had blue scleras and abnormal fragility of the bones and nine were deaf.

LÜSSI (77, **Thinning of the cornea with and without ectasia**) shows that under certain circumstances considerable and extensive thinnings of the cornea need not necessarily be associated with an ectasia, even when the tension of the eye is elevated. He also found that in keratitis disciformis there is a

marked thickening of the cornea, especially backward, in the region of the infiltrate.

SCHNYDER (79, **Studies of the normal and pathological endothelium of the cornea with the Nernst slit lamp**) says that the endothelium has a wavy surface at the periphery of the cornea, which increases with age. In the second decade minute spherical prominences appear on the posterior surface of the cornea, particularly in the periphery. Henle's warts of Descemet's membrane are generally found first in the fourth decade, mainly in the periphery and usually arranged regularly. The endothelial cells are smaller in childhood than in adult life; in old age it loses its sharp cell margins. After parenchymatous keratitis has run its course the posterior layers of the cornea reflect light strongly. Descemet's membrane is often irregular, the endothelium usually sharp, slightly polymorphous. In congenital hydrophthalmos the endothelium is polymorphous and the margins of Descemet's membrane protrude slightly toward the chamber. The condition of the endothelium is an early symptom in acute iritis and iridocyclitis; at the height of the disease the endothelium is nearly amorphous; beneath precipitates an intact coat of endothelium can often be demonstrated. The visibility of the endothelial reflexes is made difficult in old age by the reduction of the transparency of the posterior layers of the cornea. Swelling of the endothelium was found after operations that opened the anterior chamber. In a case of keratitis disciformis the endothelium in the region of the opacity was amorphous. In iridocyclitis the aqueous contains particles varying in size, the larger ones formed by balling together several cells; folds often appear in Descemet's membrane; the pictures usually described as parenchymatous spaces for the most part appertain to the posterior surface of the cornea.

The clinical history of KLEIBER'S (73, **Keratitis bullosa and scleroticans in sclerodermia**) patient is as follows: Man 44 years old; bald for twenty years. At 30 years of age mature cataract right, anterior polar cataract left. Good vision after extraction of right cataract. Attacks of gout in 1913 and 1915, in the interim a successful extraction of the left cataract. In 1915 bullous keratitis of the right eye with dryness of the skin and fragility of the nails; in 1919 the same disease of the left

eye. In August, 1919, complete sclerotic opacity of the right cornea, a year later increase of infiltrates and blebs on the left cornea. Bilateral glaucoma, tension 35mm. Wassermann negative. Diagnosis at the skin clinic, scleroderma without known cause. The cutaneous symptoms analogous to those on the cornea. The condition probably one of angiotrophoneurosis. The early onset of cataract may perhaps have been due to changes in the ciliary arteries.

GRADLE (72, **The present status of keratoplasty**) after describing some of the methods of keratoplasty which have been occasionally successful relates a case in which he cut out a disk at the edge of an opacity so that part of the disk was in the clear cornea, the trephine entering only about one third of the thickness of the cornea. He then dissected up the disk and without removing it from its bed rotated it so that the clear portion was over the pupillary area. The disk remained partly clear but unfortunately he did not cut deeply enough so that some opacity remained below the area of the operation.

ALLING.

TENNER (80, **The relief of partial or complete anterior staphyloma**) has operated upon eighteen cases of partial and complete staphyloma. He first passed sutures through the cornea outside the limits of the staphyloma using perforated gold plates on either side. An incision is then made through the length of the bulging cornea and the sides of the wound excised to the healthy tissue. He has been uniformly successful.

ALLING.

XI.—THE IRIS AND PUPILS.

81. BENEDICT, W. L. **The character of iritis caused by focal infection.** *Transactions of the American Ophthalmological Society*, 1921.

82. DIMITZ, L., AND SCHILDER, P. **Nystagmus of the pupils.** *Neurol. Zentralbl.*, 1920, No. 17.

83. FUCHS, E. **Retinal pigment cells in the iris stroma.** *Archiv f. Ophthalmologie*, ciii., Nos. 3-4, 1920.

84. WAGNER, R. **Two cases of expulsive hemorrhage.** *Münchener med. Wochenschrift*, 1920, p. 1424.

85. WICK, W. **Bilateral reflex pupillary immobility after trauma to the skull.** *Klin. Monatsbl. f. Augenheilkunde*, lxx., 1920.

BENEDICT (81, **Character of iritis caused by focal infection**) records the results of interesting experiments conducted in the

Laboratory of the Mayo Foundation with the view to determine whether bacteria taken from diseased teeth and tonsils of a patient suffering from iritis could cause the disease when injected into rabbits. He concludes that iritis may be caused by bacteria from focal infection carried by the blood stream. The affinity from iris tissue seems to develop only under certain conditions and may be lost when the organism is grown under different environment as the bacteria in the teeth and tonsils are constantly undergoing changes and may lose their virulence. There are also changes in the resistance of the body so that a constant warfare is going on between the bacteria and the body fluids.

ALLING.

DIMITZ and SCHILDER (82, **Nystagmus of the pupils**) report the following cases. Case 1: Boy 16 years old with epidemic encephalitis. Ptosis, anisocoria, deviation of one eye upward and outward. After some days nystagmus appeared on looking to the left; later weakness of the abducens. The eyes were then convergent and presented rhythmic convergence and rotatory movements inward together with synchronous contractions of the pupils and synchronous twitchings of the orbicularis. Case 2: Pregnant woman 25 years old, whose pregnancy was interrupted because of nephritis and eclampsia. Four days after the operation, on awakening from a stupor, the patient found that she could not open her right eye or move her right side, while her speech was badly affected. She was found to have spasm of the orbicularis, anisocoria of the right eye [Does this mean dilatation of the right pupil? Ed.], inability to look to the left, vertical nystagmus on looking upward, horizontal nystagmus of the right eye on looking to the right, vertical nystagmus of the left eye on looking up, slight choked disk, paresis of the left facial, and hemiparesis of the right side. Later the paralytic symptoms improved, but the nystagmus persisted. Associated with the vertical nystagmus of the left eye on looking up was a synchronous nystagmus of the pupil, while in the right eye there was an unrest of the pupil, but no nystagmus.

FUCHS (83, **Retinal pigment cells in the iris stroma**) describes two varieties of these cells, mesodermal chromatophores and retinal epithelial cells. The latter are round or

many angled, very dark, with the nucleus usually covered by pigment, while the chromatophores are, on the contrary, slender, branched, the pigment usually lighter and the nucleus visible. As a rule they are easily differentiated apart, but sometimes they are similar. The chromatophores may be densely filled with pigment, as in dark eyed men and in negroes, while the retinal pigment cells during their wanderings in the iris may become stretched out and lighter. Cell masses (Klumpenzellen) come from the anterior of the two retinal layers; how long their formation persists in postembryonal life is not known; likewise it is unknown whether they remain permanently in number and position, or whether individual cells disappear and are replaced by new ones. The disappearance might take place through breaking down within the iris, or through escape of the cell from the iris. The latter certainly occurs, and therefore spontaneous movement must be ascribed to the retinal cells, which may follow certain stimulations. Large accumulations of such cells in the healthy iris play a part hitherto unnoticed in the formation of pigment spots, and they may appear in the diseased iris. Formerly Fuchs thought that the chromatophores alone took part in the formation of this sort of *nævus* of the iris, but now he believes that retinal pigment cells not only often take part, but sometimes exclusively are concerned in the formation of the *nævi*. There are therefore, according to the kind of cells, mesodermal, retinal, and mixed *nævi iridis*. The mesodermal are the commoner, the retinal the more uncommon. The mesodermal may be pigmented in varying degrees, but the retinal are always very dark. The migration of retinal cells into the iris may also occur in pathological conditions, slowly in chronic troubles, rapidly in acute, when in consequence of the action of toxins the iris becomes necrotic. Fuchs was formerly of the opinion that the mobilization of the retinal pigment took place with no multiplication of the cells; he now modifies this view and says that exceptionally multiplication takes place.

WAGNER (84, **Two cases of expulsive hemorrhage**) reports a case of expulsive hemorrhage which occurred in a woman 71 years old with high myopia during an attack of coughing three hours after extraction of a mature cataract. His second case was that of a man 60 years old whose left eye was normal,

the right blind for two years from hemorrhage into the vitreous and detachment of the retina. For some days the externally normal eye had been red. During the night sudden pain with perforation and expulsive hemorrhage occurred in the blind eye. A tumorlike mass protruded from the palpebral fissure that resembled a prolapse of iris enveloped in blood. Microscopical examination showed it to be composed of uveal tissue, mainly choroid, and much blood.

WICK (85 **Bilateral reflex pupillary immobility after trauma to the skull**) reports the case of a nineteen-year-old girl who was struck on the head with a hammer. The immediate results were headache and attacks of dizziness. There were no muscular pareses, or other visible disturbances of the eyes. Later twitchings of the face and of the limbs appeared. Wassermann negative. The right pupil was irregular, $2\frac{1}{2}mm$ in diameter, and did not respond either directly or consensually to light, but did to accommodation. The left pupil was round, $3mm$ in diameter, and responded distinctly but incompletely to light, perfectly to convergence. Excellent vision for far and near, hypermetropia of each eye 1 D. Concentric contraction of the visual field. The diagnosis of traumatic neurosis was made, but hysteria was thought to be absent.

(To be continued.)

BOOK REVIEWS.

V.—**The Ophthalmology of General Practice.** By DR. MALCOLM L. HEPBURN, London, published by Paul B. Hoeber, New York, 183 pages. Price \$4.

Much has been written concerning the relation of the general practitioner to ophthalmology—how much of ophthalmology should he know; what eye diseases, if any, should he treat; should he attempt refraction? Dr. Hepburn's book is the best answer to these questions that we have seen. Clearly the family physician should be able to tell when a serious eye condition exists, and when an ophthalmologist should be called, just as he should be able to tell when the surgeon, the internist, or aurist should be consulted, and he should be able to treat the more simple diseases of the eye. Having been a general practitioner himself, Dr. Hepburn realizes the needs as well as the limitations of the family physician for such special work.

The chapter on the examination of the eye is especially good, and in general the description of the various eye conditions is clear, accurate, and not too technical to be understood by the average physician, and the treatments advised are reliable. Occasionally, however, we feel that Dr. Hepburn implies a greater degree of skill in the average physician than we think he really possesses,—for instance, we believe that pneumococcus ulcer of the cornea is too dangerous a disease to entrust to the average physician, and certainly most physicians should not be encouraged to use the actual cautery in such cases. The removal of an imbedded foreign body requires a greater degree of skill than is possessed by most physicians, if further damage to the cornea is to be avoided. We do not agree with the doctor's statement that glaucoma is

only a symptom, and that increase in the intraocular pressure following worry and the ingestion of alcohol is due to a rise in the general blood pressure at such times. Nevertheless, the book fills a long-felt need as a link between general medicine and ophthalmology, and may be read with profit alike by the physician in general practice and the beginner in ophthalmology.

A. H. T.

VI.—Ophthalmoscopy, Retinoscopy and Refraction. By DR. W. A. FISCHER, Chicago (with 248 illustrations including 48 colored plates), published by Dr. W. A. Fischer, 31 North State Street Chicago, Ill.

This is a very elementary book. It consists of 218 pages, more than 50 of which are taken up with illustrations.

Ophthalmoscopy is taught chiefly by means of a schematic eye, in the back of which are placed pictures representing various fundus conditions. The same schematic eye is used in teaching refraction and retinoscopy. In the sections on ophthalmoscopy and perimetry the subjects presented are treated with extreme brevity—practically no mention being made of etiology or pathology, and while there are some good features, it savors too much of the quiz-compend-manikin method of teaching, once so popular in the now extinct fourth-rate medical schools. It gives the student a certain familiarity with the names of diseases, but practically no knowledge of pathological conditions. The same may be said of the chapters on retinoscopy and refraction. While some of the methods described are good, the chapter on optics, upon which these subjects must be based, is too elementary to give the student any practical knowledge of these subjects.

The especially objectionable feature of the book, however, is that throughout it gives the impression that the general practitioner may successfully practice ophthalmology with no other equipment than the meager, superficial, inaccurate knowledge that may be obtained from its study. It is a decided step backward at a time when the general tendency is—and ought to be—for higher standards in medical education. It is an appeal to the mentally lazy physician seeking a short cut to ophthalmology. But there is no short cut to ophthal-

mology, and the sooner the prospective ophthalmologist realizes that a working knowledge of this important branch of medicine can only be obtained after a thorough training in anatomy, physiology and pathology, and clinical experience received in a good eye hospital, the better for him and for the public at large.

A. H. T.

ARCHIVES OF OPHTHALMOLOGY.

RECURRENT PARALYSES OF THE EYE MUSCLES WITH ESPECIAL REFERENCE TO OPHTHAL- MOPLEGIC MIGRAINE.¹

By DR. A. DUANE, NEW YORK.

THE following cases are reported as illustrating unusual types of recurrent paralyses of the eye muscles.

CASE I.—OPHTHALMOPLEGIC MIGRAINE; RECURRENT PARESIS OF THE ABDUCENS. Milton S., aged 17. For two or three years has noticed that he sees double when looking to the right, but no deviation of the eyes was noticed until the present series of attacks.

For five months attacks of pain in the right eye, recurring first at intervals of two weeks and then lasting three or four days; afterward recurring at intervals of a week or less. At present, pain may recur at intervals of a few hours and then last but a few minutes. In severe attacks, pain associated with nausea and vomiting. No disturbance of vision during attacks, but latter are preceded by a period of irritability and depression.

For five months mother and other members of family have noticed that just before and during each attack patient looks decidedly cross-eyed. The strabismus usually lasts a week and then disappears. The attending physician says that in the intervals between the attacks there is no apparent deviation and no limitation of movement of the right eye outward.

¹ Read before Section on Ophthalmology, New York Academy of Medicine, April 16, 1923.

Status Præsens.—Movements of right eye outward less than normal by 3mm: movement of left eye outward slightly less than normal. Other movements normal. On tangent curtain homonymous diplopia, in right field only, increasing as eyes are carried to right. No vertical diplopia in any direction of the gaze. Pupils equal; light reaction sharp and equal in the two eyes; slight convergence reaction. Interior normal.

In this case there had evidently been for some time a slight right abducens paresis causing the diplopia that the patient had observed when the eyes were directed to the right, but no noticeable deviation. After this had lasted some years there developed attacks of right-sided migraine, conjoined apparently with marked exacerbation of the paresis. We say "apparently," for, while it is fairly certain that the periodic limitation of movement in the right eye and the accompanying characteristic diplopia were due to a weakness of the external rectus, the description is not sufficiently detailed to exclude absolutely a condition of periodically recurring convergence spasm.

Granting, however, that the condition is one of abducens paresis, it is noteworthy, first, as exhibiting one of the rather rare types of ophthalmoplegic migraine (see *infra*); second, because of the very short intervals between the attacks; and, third, because the exacerbations of paralysis apparently set in before the headache instead of afterward, as is the almost invariable rule.

CASE 2. RECURRING INCOMPLETE AND PARTIAL OCULOMOTOR PARALYSIS WITHOUT MIGRAINE.—Frederick H., aged 58. For twenty years has had at intervals of several years at least seven attacks of double vision unassociated with headache. Diplopia always vertical. During attacks there is no apparent deviation of the eyes. Present attack began two months ago. His physician reports that he has high blood pressure and albumin and casts in the urine.

Status Præsens.—In following a moving object shows left hyperphoria increasing moderately in looking up and to the right; diminishing as eyes are carried down, but well marked again in looking down and to the left. On tangent curtain diplopia increasing moderately in the same sense. Fields by rough test normal for large white objects. Interior normal.

Here there was a recurrent vertical diplopia, not very far from comitant, due, it would appear, to a moderate paresis of the right superior and left inferior rectus. The case is singular in that for twenty years the paralysis had remained incomplete and probably always confined to a single muscle in each eye, and that it was unassociated with migraine.

Still more aberrant were the following cases:

CASE 3. MIGRAINE ASSOCIATED WITH INTERMITTENT CONVERGENCE PARESIS.—Sophie K., aged 23. Quite anæmic. Had post partum hæmorrhage two and a half years ago and an operation afterward. Mother has migraine with scintillating scotoma.

For one and a half years almost constant bilateral supra-orbital pain. Photopsiæ frequent. Very marked asthenopia with pain in eyes. Objects within one or two feet look double.

Attacks in which there is first diplopia for five minutes, then a scintillating scotoma lasting ten to fifteen minutes, then severe pain with nausea and chilliness.

Status Præsens.—Vision normal, right and left; slight hyperopic astigmatism shown by test with homatropine. Exophoria 1-2 ∇ for distance, 8-10 ∇ (varying) for near. Near point of convergence at first 10 to 12cm from inter-central base line, but after a moment she shows crossed diplopia persisting when object of fixation is carried out to one meter. At another examination, diplopia persisted out to 5 meters, and patient was unable to make any effort to converge. In looking to either right or left the crossed diplopia is less than in looking straight ahead. Conjugate movements of eyes, and in particular the movement of each eye inward, normal.

Correction of the refraction ameliorated the headaches but produced little change in the muscular conditions.

Here there was a convergence insufficiency of only moderate degree, which very readily was converted into a convergence paralysis, producing insuperable crossed diplopia and rendering the patient temporarily unable to converge the eyes, although the power of inward rotation per se remained normal. This paroxysmal development of paresis and diplopia regularly preceded the attacks of migraine, which themselves were ushered in by the usual scintillating scotoma. This succession of symptoms, as before remarked, is very uncommon, for when

paralysis is associated with migraine it almost always follows the latter.

CASE 4. RECURRENT MIGRAINE WITH UNILATERAL MYDRIASIS.—Malcolm M. K., aged 20. Nine or ten months ago attack in which left pupil dilated and a scotoma developed, occupying the left half of each visual field. This was followed by very severe headache. Yesterday similar attack, only more severe. Left pupil, he says, was still somewhat dilated this morning. When later in the day he reported for examination, the pupils were equal and very mobile. Reactions to light (direct and consensual) and to convergence normal. Accommodation equal in the two eyes and normal. No limitation of movement.

After this had only occasional headaches.

Three years later examination on several occasions showed left pupil at times equal to the right, but usually under all conditions of testing 1mm wider. Both pupils wide (right 4-6mm, left 5-7mm) and very mobile. Reactions normal (contraction of left to convergence at least fully equal to that of right). Accommodation equal and normal in the two eyes.

In this case also the motor anomaly, which was confined to the iris, preceded the migraine. It remained as a more or less persistent condition three years later although the attacks of migraine had ceased or had become infrequent. The motor anomaly itself consisted either in a unilateral paresis of the sphincter, or, more likely, in a unilateral spasm of the dilatator iridis set up by sympathetic irritation.

TYPES OF RECURRING PARALYSES.

Recurring paralyses of the ocular muscles comprise two rather well-differentiated types, viz. those due to nuclear and those due to basal lesions.

Recurrent Nuclear Paralyses.—Recurrent nuclear paralysis is most frequently produced by tabes. Such paralyses are often quite transient and are frequently both partial and incomplete; they may be bilateral; and in recurring may affect a different muscle from that first involved. They may affect the exterior muscles, the interior being exempt, or vice versa.

According to Wilbrand and Saenger these recurring tabic

paralyses may be ascribed to a repeated toxic action of the syphilitic virus on the nuclei. When, as often happens, this repeated action produces degeneration of the nuclei, the paralysis becomes permanent.

Naturally, with paralyses of this sort, even in the transient stage, we find other evidences of tabes (Argyll-Robertson pupil, absence of patellar reflex, Romberg symptom).

While the great majority of tabic paralyses are nuclear, they may occasionally be due to a peripheral inflammation of the nerves themselves and so be of basal or possibly even of orbital origin (Dejerine and others cited by Wilbrand and Saenger).

Recurrent paralyses quite similar to those in tabes may be produced by diabetes, the lesion here consisting probably of minute hemorrhages into the nerve nuclei.

Recurrent nuclear paralyses may also occur in chronic progressive ophthalmoplegia. The characteristic marks of these cases are the absence of headache, the bilateral character of the paralysis, the peculiar fluctuations in its intensity, and the non-involvement of the interior muscles (Wilbrand and Saenger).

Other forms of recurrent paralysis due to nuclear lesion occur at times in chronic ophthalmoplegia combined with lesions of the bulbar nuclei and of the anterior horns and in bulbar paralysis (Wilbrand and Saenger).

Basal Recurrent Paralyses.—Basal recurrent paralyses may be due to a peripheral neuritis or to an intermittent compression of the nerves at the base resulting from the presence of a tumor, of vessels distended by aneurysms or other causes, or of inflammatory deposits. The cause of these lesions may be syphilis, tuberculosis, multiple neuritis, or trauma, and other cases have been ascribed to toxic conditions (autotoxis or focal infections), but in most cases the cause is quite uncertain. The type form of these paralyses is ophthalmoplegic migraine, which will be described more particularly below.

Some cases of recurrent paralysis may conceivably be orbital in site, being due to disease of the accessory nasal sinuses or to peripheral neuritis.

Cyclic Paralysis.—Mention must be made of the extremely rare condition called cyclic paralysis, cases of which have been described by Fuchs, Rampoldi, and Axenfeld and

Schürenberg. In this a condition of complete oculomotor paralysis with ptosis alternates every minute or two with rhythmic spasm of the levator and the interior muscles, so that the drooping lid rises, the eye converges slightly, the dilated pupil contracts, and the paresis of accommodation is replaced by a spasm, increasing the refraction by several dioptries. The condition is most common in females, and is either congenital or acquired very early in life. The site of the lesion is unknown.

OPHTHALMOPLAGIC MIGRAINE.

Historical.—As already stated the type form of recurrent basal paralysis is the condition which Charcot called ophthalmoplegic migraine.

The first mention of this condition seems to have been made by Notta (1854) who said that 6 out of 128 cases of trigeminal neuralgia showed ptosis and of these 6 three also showed an outward squint. Cases were published by Gubler in 1860, Mauthner (v. Graefe's case) in 1861, Saundby (1882), v. Hasner (1883), and Möbius (1884). The latter then defined the condition in terms that have been followed ever since. Afterward numerous other cases were published, and these have been summarized by various authors, e.g., Mauthner in 1889 (epitomizing 14 cases), d'Alché in 1896 (29 cases), Spicer and Ormerod in 1896 (30 cases), Mingazzini in 1897 (over 40 cases), Wilbrand and Saenger in 1900, Finlay in 1908, and Wilbrand and Saenger again in 1922. In all about 180 cases have been described, although it is likely that some of these were not genuine. For the descriptions are often very imperfect, and some of the summaries—especially the later ones—in which they are cited, contain not a few errors, the titles and the descriptions of the cases being sometimes quite inaccurate. I have sought, wherever I could, to verify the references given by Wilbrand and Saenger and others, but have by no means always succeeded. I have tried, however, in what follows to avoid inferences based on any description whose authenticity has not been verified or is not practically certain.

Characters.—As described by Möbius and most of the authors, ophthalmoplegic migraine is a condition, developing

in childhood or infancy, and characterized by irregularly recurring, severe, usually one-sided headaches, which are associated with nausea and vomiting but not with scintillating scotoma, and which after lasting for days or even weeks disappear and are replaced by a unilateral oculomotor paralysis usually on the same side as the head pain. This paralysis, which may develop before the migraine subsides completely, is at first partial and incomplete, but soon becomes total, *i.e.*, affects all the muscles supplied by the nerve, including the interior muscles and the levator, and also becomes complete. After a variable time—days or weeks—the paralysis subsides only to recur at some time later in conjunction with another attack of head pain. This regular association of paralysis with migraine-like attacks may occur at the very outset of the trouble, but in most cases there is a pre-paralytic period during which the patient suffers simply from the recurring head pains; then after these have been going on for a long time—it may be many years—the paralytic attacks set in.

In the intervals between the paralytic attacks the paralysis may disappear completely (intermitting paralysis) or may remain in part (remitting paralysis). As the disease goes on the tendency of the paralysis to persist in the intervals becomes more marked, and finally—frequently after the lapse of a number of years—it does not disappear at all, so that one oculomotor nerve remains permanently and completely paralyzed. The migraine attacks keep on whether the paralysis intermits, remits, or becomes permanent.

At first it was thought that the condition was more frequent in females, but in the cases so far recorded in which the sex was noted 77 were males and 66 females.

Variations in Symptoms and Course.—Such is the type form of ophthalmoplegic migraine. Some would have it that it is the only form, *i.e.*, that the disease always begins early in life, always affects the oculomotor nerve and no other, is always complete and total, and always recurs in the same eye. But these statements are too sweeping, for there are many undoubted cases of the condition which do not conform to them.

1. The paralytic attacks do not always begin in early life. It is true that in the great majority of cases they begin before the age of 20, and the migraine attacks begin earlier still—

usually in childhood. In some cases, indeed, the symptoms develop very early, paralysis setting in at the age of 8 months (Shaw), 11 months (Möbius), one year (Case 2 of Spicer and Ormerod, Case 2 of De Schweinitz), one and a half years (De Schweinitz' Case 1, Snell, Wolff, Leavitt), two years (Koch, Rozsa, Steenhuisen, Case 3 of Spicer and Ormerod), or three (Klinedinst). On the other hand, in two of Wilbrand and Saenger's cases the paralysis set in at the ages of 25 and 33, in three of Fisher's at 30, 32 and 33, in Case 1 of Danis's at 27, in Case 1 of Charcot's at 35, in Strzemieski's at 37, in Dabney's at 45, in Chabbert's at 52 and 53, and in Darquier's at 63.

2. The paralysis may develop before the patient begins to have migraine attacks at all, as in cases reported by Hinde and Moyer, by Shaw, and in my Case 1.

3. Migraine may be absent altogether, the patient having recurrent paralytic attacks, otherwise characteristic. Thus there were recurrent attacks of oculomotor paralysis without migraine in my Case 2, in the cases reported by Dabney (followed for 17 years), Gubler, Weiss, Valude and Frogé, and in two cases reported by Parenteau; and a recurring abducens paralysis without migraine is reported by Spicer and Ormerod (Case 5).

4. In very rare cases in the attack the paralysis may precede the migraine. This apparently happened in my Case 1, as well as the aberrant Cases 3 and 4, and in the cases of Snell, in which the attack was ushered in by ptosis. In Colman's case, a sort of motor spasm preceded the migraine; *i.e.*, the upper lid flapped up and down at intervals during a quarter of an hour, then migraine set in followed by third-nerve paralysis with ptosis. This curious flapping motion of the lid was repeated during succeeding attacks, even after the third nerve paralysis including the ptosis had become permanent.

5. Not infrequently after the patient has begun to suffer from attacks of paralysis with migraine, these attacks alternate with attacks of simple migraine without paralysis. This was noted in at least 14 cases and may very likely have occurred in a number of others, whose histories are imperfectly recorded. It seems also that it is possible to abort an attack so that it does not go on to paralysis. A patient observed by Alger, who

suffered from typical ophthalmoplegic migraine, asserted that he could cut off an attack by going to sleep or indulging in sexual intercourse.

6. The head pain is occasionally preceded by a scintillating scotoma. This was present in my two aberrant cases (Cases 3 and 4), and in cases reported by Chabbert, Spiller and Posey, Romano, Fisher (Cases 4 and 5), and Wilbrand and Saenger (Case 2).

7. The paralysis during an attack is by no means always either complete or total. Sometimes it is partial and incomplete during the first attack and complete and total later; at times it remains partial throughout the disease or, at least, during the period of observation. This was seen in my Case 2 and in quite a large number of other cases reported.

Of special interest are the cases in which the recurring paralysis is confined to the interior muscles. Apart from Hansell's cases of recurrent ophthalmoplegia interior, of which probably perhaps only one belongs in the condition here under consideration, and apart from my somewhat dubious Case 4, Troemner reports a cure of recurrent migraine with unilateral ophthalmoplegia interior, and Wilbrand and Saenger report (Case 3) a very interesting case of ophthalmoplegia interior with migraine recurring with menstruation. I saw in the care of another physician, who will report it, a case of recurrent complete paralysis of accommodation with migraine occurring in a young girl.

8. The paralysis may affect other nerves than the oculomotor. Isolated recurring paralysis of the abducens is not so very rare, occurring in about 8 per cent. of the cases of ophthalmoplegic migraine. Thus it was present in my Case 1 and in cases reported by De Schweinitz (Case 2), Wolff, Spicer and Ormerod (Cases 6 and 7), Fisher (Cases 4 and 5), Seele, Armaignac, Bernheimer, Brav, Leavitt, Veasey, and Danis.¹ With regard to these cases I would point out the possibility, already touched on, of an error in the diagnosis, due to the fact that a paralysis of the abducens may be simulated by a convergence spasm when the latter is of such intensity as to prevent the movement of either eye outward. This cause of

¹ In Marina's case, often referred to as one of simple abducens paralysis, the 3d and 6th nerves were both affected. (See below).

error can usually be eliminated if we cover the non-deviating eye, thereby breaking up the strong tendency to converge. Then, if the case is one of convergence spasm, the eye can be got to move well out, whereas it will not do so if the case is one of abducens paralysis.

9. So also, but more rarely there may be a typically recurring isolated paralysis of one superior oblique. Such cases have been reported by Fisher (Case 2),¹ Bornstein, v. Luzenberger, and Scremini (this case and Fisher's, however, had but one attack).

10. Isolated recurrent paralysis of the facial, associated with migraine, also occurs (Rossolino, Hatschek). Bernhardt reports four unilateral cases, some with, some without pain; but it is doubtful if any of them belongs to the type of paralysis here considered. In one of these cases, there was apparently recurrent paralysis of the auditory nerve as well.

11. There may be paralysis of several nerves on the same side. The combinations reported are:

(a) Paralysis of oculomotor and abducens. Cases reported by Charcot (Case 2), Carpenter, Contouzis,² Mendel and Marina. In Carpenter's case there was first a simple oculomotor paralysis, then an abducens paralysis was added.

(b) Paralysis of oculomotor (exterior branches), abducens, and hypoglossus (Sil). Compare also Fisher's Case 4 in which at one time the hypoglossus, at another the abducens was affected.

(c) Paralysis of the oculomotor and trigeminus (Haynes, Vissering). Combinations of oculomotor paralysis with hyperæsthesia, anæsthesia, and paræsthesia in areas supplied by the trigeminus are fairly common.

(d) Paralysis of oculomotor, abducens, and trochlear nerves, *i.e.*, complete unilateral ophthalmoplegia (Brissaud, Sciamanna). Carpenter's case seems ultimately to have become a nearly complete total ophthalmoplegia. Gasparini's was

¹ Fisher's Case 3 may also have to be included here, although the description of the diplopia (diplopia in the sense of a right hyperphoria increasing to the left) leaves one in doubt whether the case was one of paralysis of the left superior rectus or the right superior oblique.

² Contouzis says paralysis of third and fourth pairs; but from his description it is evident that this is a slip of the pen.

one of unilateral ophthalmoplegia exterior. (Parenteau's case stated to be an ophthalmoplegia was a 3d nerve paralysis).

(e) Paralysis of abducens and later of facial also (Spicer and Ormerod's Case 5).

(f) Paralysis of abducens and superior oblique of one eye with diplopia indicating possibly a paresis of the superior rectus on the same side or more likely a paresis of the superior oblique on the other (Paderstein's Case 2).

(g) Paralysis of the abducens superadded to a divergence paralysis (Winawer).

(h) A rather uncommon combination is that of paralysis of the eye muscles with disturbances of the auditory nerves, evidenced by tinnitus or deafness.

(i) Motor paralysis associated with affections of the optic nerve and also with visual disturbances without evident cause, sometimes occur. Thus, apart from some cases in which there was congestion or inflammation of the nerve head, others occasionally occur in which there is amaurosis or amblyopia of the affected eye without apparent lesion.

In Spiller and Posey's case the blindness which lasted half an hour and was accompanied by photopsiæ seems to have been simply an exaggerated form of the scintillating scotoma which precedes a migraine. But in Fisher's Case 4 the blindness did not wholly disappear for two or three days and in the case described by Kollarits it lasted three weeks and left a permanent amblyopia. In five other cases cited by Wilbrand and Saenger, in Rozsa's case, and in one (Saundby's) cited by Spicer and Ormerod the motor paralysis was associated with either amblyopia or amaurosis. It is questionable, however, in some of these cases whether the amblyopia was not a pre-existent condition and thus independent of the ophthalmoplegic migraine.

In one or two cases the visual field has been contracted. Such a contraction has been thought to indicate a functional disturbance (hysteria), but in the case described by Thomsen and Richter a contraction of the field increasing and diminishing with the paralysis was associated with an organic lesion of the oculomotor nerve.

(j) The paralysis may be associated with paræsthesiæ of various kinds, disturbances of secretion, fever, convulsions, etc.

12. Sometimes the paralysis is bilateral. The following combinations are reported, some of which, however, quite certainly do not belong with true ophthalmoplegic migraine.

(a) Paralysis of a single muscle in each eye (my Case 2).

(b) Oculomotor paralysis alternating between the two eyes¹ (Darquier).

(c) A gradually developing oculomotor paralysis, at first alternating between the two eyes, but ultimately terminating in an almost complete bilateral ophthalmoplegia exterior (Spicer and Ormerod's Case 4). Somewhat similar was the case of Chabbert.

(d) Ophthalmoplegia exterior alternating between the two eyes (Ziehen).

(f) Oculomotor paralysis in one eye and abducens paralysis in the other (Charcot).

(e) Ocular paralysis recurring every year for 24 years, ending finally in total bilateral ophthalmoplegia; respiratory paralysis, and death (Dubois).

(g) Bilateral total oculomotor paralysis combined with bilateral, nearly total paralysis of the abducens and probably also paralysis of the trigeminus (Leclerc).

(h) Oculomotor paralysis in one eye and facial paralysis in the other (Saundby).

(i) Bilateral oculomotor paralysis combined with facial paralysis (Cantalamesa).

(j) Alternating oculomotor paralysis with at times paralysis of the facial or of the facial and abducens on one side (Pflüger).

(k) Alternating paralysis in which the left facial, the left abducens and hypoglossus, the right facial and auditory nerves, the right abducens and left facial, and the right facial were affected in successive attacks (Nieden).

(l) Alternating paralysis of facial alone (case of Rossolino and one of Bernhardt's).

(13) The course is not always that described. While in most cases the paralysis tends more and more to persist in the intervals between the attacks and ultimately becomes permanent, there are cases in which, at least for many years, it remains

¹ Wilbrand and Saenger (I. p. 493) cite Anderson's case reported by Jack, as a bilateral case (ptosis in both eyes). But as Jack points out, the ptosis in the left eye was apparent only.

intermittent. Thus it so remained for 20 years in my Case 2, for 13 years in the case reported by Danis, 14 in Spicer and Ormerod's Case 1, and 17 in Dabney's case. (The last case is particularly convincing since Dabney had it under observation during the whole time). In Karplus's third case, the paralysis had recurred for over 42 years without becoming total. In other cases the attacks, instead of increasing, even lessen in severity (cases of Parinaud, Priestly Smith). This was noted as a temporary happening in some of the progressive cases. Finally, there are a few cases in which there is a cure or, at least, a period of many years in which attacks are absent (cases of Clarke, Morgano, Bernhardt's Case 1). Bernhardt's case is specially remarkable since the disease had begun some forty years before.

Nature of Ophthalmoplegic Migraine.—The symptoms of typical ophthalmoplegic migraine make it certain that the condition cannot be nuclear in origin. For most of the cases exhibit sooner or later a total and complete paralysis of the third nerve on one side, and for such a paralysis to be nuclear would require lesions distributed in a quite peculiar fashion in both oculomotor nuclei. The condition must, in fact, be due to injury of the radicles or trunk of the oculomotor nerve itself, in the latter case being basal.

This view is supported by the results of pathological investigation. The cases that have come to autopsy¹ show either a benign tumor, an inflammatory exudate, or a tuberculous mass involving the nerve and producing degeneration of its fibers. It seems likely, indeed, that a basal organic lesion of some sort is the cause of most of the typical cases of ophthalmoplegic migraine. Periodic variations in the size of a compressing growth or periodic variations in the size of the adjoining organs (blood-vessels, etc.), would account for the attacks and the remissions, and permanent paralysis would set in when the pressure had produced destructive changes in the nerve.²

¹ Reported by Gubler, Weiss, Karplus (2d case), Richter-Thomsen, Shinoya. In Duboy's case, which does not probably belong here, there was found simply meningeal congestion. No microscopic examination, however, was made.

² This conception of the condition is practically that enunciated by P. C. Knapp in his survey of the condition many years ago.

Shinoya thinks that the reason why the oculomotor nerve is predominantly affected is that the latter lies between the posterior cerebral and the superior cerebellar arteries. Von Luzenberger thought that the recurrent trochlear paralysis in his case was due to periodic distention of the cavernous sinus producing intermittent pressure on the first branch of the trigeminus and on the trochlear nerve.

There seems no reason why recurrent isolated paralyses of the fourth and sixth nerves with head pain should not be accounted for in the same way as similar isolated paralyses of the third nerve. They are doubtless likewise due to basal lesions and should be classed with ophthalmoplegic migraine. The like is probably true of most of the cases of combined paralyses, *i.e.*, paralyses of two or more nerves on the same side. More dubious are the cases of recurrent bilateral paralysis, especially those which exhibit the type of an ophthalmoplegia exterior or in which the successive recurrences differ in character. Such paralyses are more likely to be nuclear. The same is true of bilateral picked paralyses, like my Case 2.

Wilbrand and Saenger would differentiate from true ophthalmoplegic migraine the very similar recurrent paralyses with head pain caused by chronic meningitis, multiple neuritis, or internal hydrocephalus. But if these processes by intermittent pressure on the individual motor nerves at the base produce the symptoms of an ophthalmoplegic migraine, it seems difficult to see why this name should not apply to the paralysis so called, just as it does to paralyses caused by a basal tumor.

On the other hand, the condition should be differentiated from the paralyses of nuclear origin, especially the ordinary tabic paralyses or from a progressive ophthalmoplegia exterior. Yet, just as in rare cases some tabic paralyses are of basal origin, so some of the more aberrant forms of ophthalmoplegic migraine may be nuclear. My Case 2 of recurrent bilateral paresis without migraine was doubtless nuclear, and my Case 3 of recurrent convergence paralysis with migraine must have been nuclear or supranuclear.

The relation between the ophthalmoplegia and the migraine has been much disputed. Charcot, followed still by many authorities, believed that the migraine was the cause of

the paralysis in the sense that the recurrent vaso-motor disturbance produced by the migraine finally induced or rather favored the development of structural changes.¹ Others hold the reverse view, *i.e.*, that a structural condition exists which by causing pressure alike on the trigeminus and the motor nerves sets up both the migraine and the paralysis. The second hypothesis seems to explain better the totality of symptoms of this protean condition,² and is not incompatible with the fact that the migraine may exist for years before paralysis develops.

Möbius and others have objected to the term migraine as applied to the paroxysmal headache that accompanies the disease. They say that this differs from a true migraine in the absence of a family history of migraine, the absence of a scintillating scotoma, the long duration of the headache as well as the long duration of the intervals, and the fact that the head pain begins in childhood or infancy instead of after the age of puberty and tends to persist steadily through life instead of finally disappearing with age. To this it may be answered that a familial character is not so infrequent in this disease, that a scintillating scotoma is sometimes present, and that the head pains present many of the characters of a true migraine, *e.g.*, its unilateral character and its association with nausea, vomiting, and physical depression. Furthermore, migraine itself is more or less protean in its manifestations, so that we

¹ It seems worth while to quote the precise words of this great clinician. After citing Gubler's and Richter's autopsies, the former showing a tuberculous growth, the latter a benign neoplasm, he says: "Il est clair que les productions bacillaires dans un des cas, le fibro-chondrome dans l'autre, n'ont pas été les agents primitifs et uniques de l'évolution du processus morbide. La périodicité des accès, la complète disparition des accidents dans leurs intervalles, du moins à l'origine, l'ancienneté du mal enfin remontant à l'enfance ne permettent guère de l'admettre. C'est seulement par la répétition multipliée des crises que les lésions, purement dynamiques et essentiellement temporaires d'abord, ont laissé subsister après elles une épine et un point d'appel, un lieu 'de moindre résistance,' sur lequel se sont fixés, de préférence, sous l'influence de l'état diathésique et indépendamment de l'affection migraineuse, les produits néoplasiques."

² Especially the cases in which migraine is absent and those in which paralysis develops with the very first attacks of migraine or in which it actually develops before the latter.

should not say that a head pain is not a migraine, simply because it lacks some of the ordinary characters of the latter.

As direct exciting causes of the condition have been given traumatism (v. Graefe's case reported by Mauthner, Richter-Thomsen, Platenga, Gubler); uric-acid poisoning (Priestley Smith); autoxis from intestinal putrefaction (several authors on what seem uncertain grounds). Other cases were associated with disease of the accessory sinuses, otorrhœa, and bad teeth, but the causal relation between these conditions and the paralysis is not clearly proved. Cases have been reported in which the paralysis recurred with attacks of typhoid or typhus fever and with successive attacks of relapsing fever, as in Mironesco's patient. Other cases have been ascribed to malaria. In several it has been noted that attacks recurred with menstruation (cases of v. Hasner, Morgano, and Romano and Wilbrand and Saenger's Case 3, in which there was a recurrent ophthalmoplegia interior); and Kipp, Mariana, and Brav report cases in which paralysis recurred in successive pregnancies.

A few cases have been regarded as purely functional (hysterical), but the evidence for this does not seem very convincing. As before noted, the varying contraction of the visual field occasionally noted does not necessarily indicate functional disturbance, and in a disease which disappears spontaneously for an indefinite period an apparent cure by electricity or suggestion may well be questioned. Furthermore in few or any of the cases did the symptoms appear to be such as to suggest a functional origin.

Assembling our facts, we may say that ophthalmoplegic migraine is not a morbid entity but rather a peculiar syndrome characterized by irregularly recurring, usually prolonged, migraine-like attacks which terminate in a complete or incomplete paralysis of one or more of the motor nerves of one eye, especially the third nerve. The paralysis, at first intermittent, tends to become later remittent, then permanent. Coincident affections of other nerves, especially the 5th, 7th, and optic nerve, occasionally occur. In a few cases the condition is bilateral, but most cases of bilateral recurring paralysis present a different picture and fall into another category. The cause of genuine ophthalmoplegic migraine

is generally a basal lesion of varying character, but a few cases are probably nuclear in origin.

Treatment of ophthalmoplegic migraine has in general proved futile. Clarke apparently relieved one case by correction of the refraction; and Priestley Smith by dietetic treatment relieved another of the headache but not of the paralysis. Removal of all possible causes of infection (intestinal or otherwise) and improvement of the general condition in every possible way would always be in order. Relief may be afforded in this way. But a case would have to be under observation for a long time before one could with certainty report it as cured.

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FURTHER OBSERVATIONS ON "NEW METHOD
OF PREVENTING POST-OPERATIVE INTRA-
OCULAR INFECTIONS."¹ REPORT OF 1250
SUCCESSFUL CASES.

By DR. GEORGE HUSTON BELL, NEW YORK.

IN presenting to the medical profession my second paper on the prevention of "Post-Operative Intraocular Infections," it is a matter of profound gratification to be able to state that in the 1250 cases herewith presented there has not been a single primary infection or a case of panophthalmitis. This, I think, is a great tribute to the method employed.

In my first paper before the American Medical Association in 1921, my technique was outlined and has not since been changed. The time has come when we can now approach the operating table with a feeling and a confidence, such as we have not had in the past, and I feel that a great load has been lifted from the shoulders of most ophthalmic surgeons.

How often have you witnessed an infection following intraocular operations? Unfortunately, this calamity has overtaken us all. How often have you been told by the bacteriologist that the smear from the conjunctival sac was dirty and how often have you waited for days for the smear to become negative before operating? You then operate and dress the eye with fear and trembling, forty-eight hours afterward. Again, we have been told by the bacteriologist that the smear was negative; we operate and in forty-eight hours, we dress the eye and find an infection—this, I believe, has happened to us all.

¹ Read before the Section on Eye, Ear, Nose and Throat, at the Annual Meeting of the Medical Society of the State of New York, at New York City, May 23, 1923.

In no case of our 1250 did we wait for a single day before operating to clean up whatever was found in the smear from the conjunctival cul-de-sac.

Much valuable time is lost by trying to clean up the conjunctiva when there is a questionable smear. The time that is lost is due to inadequacy of hospital facilities and also to patients. According to my method we do away with all this "lost motion." If a patient's eye looks clinically clean, we go ahead and operate regardless of the findings in the smear. The so-called "senile catarrhs" are not looked upon as clinically unclean by us. But we do exert pressure over the lacrimal sac in such a way as to cause the smallest quantity of fluid present in the sac to flow back through the canaliculi. Cases of mild infection limited to the sac will thus be detected and must be cleared up before we regard the eye as clinically clean. In other words we pay no attention to the findings of the bacteriologist.

I have such strong faith in my method of treatment that I am anxious for all ophthalmic surgeons to give it a trial, unless they have some better plan of procedure.

TECHNIQUE.

First step—The focal infections, such as oral sepsis, diseased tonsils, and toxemias of the intestinal tract, must be removed. I hold that it is just as necessary for the ophthalmic surgeon to get his house in order before subjecting his patient to a major operation upon the eye, as it is for the general surgeon to clean house. Every patient of mine, whether clinical or private, must stand the acid test for the "Three T's" (teeth, tonsils, and toxemia) before we even consider the operation. This routine is carried on in my clinics at the New York Eye and Ear Infirmary, and the New York Polyclinic Hospital, and also in my private practice. I said in Atlantic City at the A. M. A. session in 1919, that "a dirty mouth was one of the greatest menaces to the human race." I wish now to reaffirm and confirm that statement. We must make no mistake about oral sepsis, as it is the arch enemy of the ophthalmic surgeon. The germs themselves and toxins or their poisonous products must be eliminated from the system as far as lies in our power,

if we are to better our cataract results. In this way we can hope to reduce the amount of secondary post-operative infections. If we clean the blood by getting rid of toxemia, then we will raise the resistance of our patients, so that we may be able to approach the operation with a confidence and courage such as we have not had in the past. We must bear in mind that the longer toxemia exists the less nerve energy and resistance there is.

All of this work on focal infections must be done from two to three months before the patient is admitted to the hospital. I lay great stress on this work, as we must study the general state of patients more than we have done in the past. A Wassermann test is made in zonular and complicated cataracts also in hard cataracts, when necessary.

The urine is examined several times previous to the operation, and the height of blood pressure must be known.

Second step—The patient is then admitted to the hospital. Twenty-four hours before the operation, a dose of castor oil is given, as nothing sweeps and cleans the intestinal tract like castor oil. Castor oil has been the standby of physicians since time immemorial. I know of no substitute for it.

Third step—Two hours before the operation, a smear of the conjunctival sac is taken, after which two drops of a 1 per cent. solution (5 grains to an ounce of distilled water) of silver nitrate are instilled into each eye.

The silver produces an irritation, but not an inflammation, so that when the patient comes to the operating table the eyes look red and inflamed, with a certain amount of mucus at the inner corners. The brow, the eyelids, and adjacent skin are washed thoroughly with castile soap and water and the eyes are then washed out with a normal salt solution, as a means of freeing the operating field of mucus, dust, etc. I am now using novocaine (2% solution) paralysis of the orbicularis as a routine, and regard it as a great advance in the technique of extraction. Also it is imperative to have your assistants wear sterile rubber gloves. After the patient is well under the local anæsthesia, the operation is performed. We always try to get a conjunctival flap. Our usual technique is then employed. Afterward we use 2 drops of 3% solution of atropine, and a 25% solution of argyrol, after which both eyes are bandaged for

forty-eight hours. Then every two days, the eye is dressed and argyrol and atropine instilled.

OPERATIONS PERFORMED IN 1250 CASES OF INTRAOCULAR DISEASE.

<i>Case</i>	<i>Diagnosis</i>	<i>Smear</i>	<i>Operation</i>
10	Chronic glaucoma	Pus, mucus, large diplococci	Lagrange
145	Immature and mature senile cataracts	Negative	Prelim. iridectomy
50	Mature senile cataracts	Epithelium, K.L.B.	Prelim. iridectomy
50	Mature senile cataracts	Leucocytes, large and small diplococci	Prelim. iridectomy
75	Mature senile cataracts	Pus, leucocytes and mucus	Prelim. iridectomy
65	Glaucoma	Negative	Iridectomy
25	Acute Glaucoma	Pus, pneumococci, mucus	Iridectomy
25	Old iritis	Mucus, leucocytes, no bacteria	Iridectomy
20	Occluded pupil	Negative	Iridectomy
20	Anterior synechia	Negative	Iridectomy
30	Chronic glaucoma	Negative	Lagrange
10	High myopia	Negative	Linear extraction
10	High myopia	Negative	Discission
20	Chronic glaucoma	Pus, cells, mucus	Trephine
15	Capsular cataracts	Occasional diplococci	De Wecker's
15	Secondary cataracts	Pus cells, mucus, bacteria	De Wecker's
10	Postpolar cataracts	Mixed germs, diplococci	Discission
20	Zonular cataracts	Negative	Discission
10	Zonular cataracts	Pus cells, mucus, bacteria	Discission
30	Secondary cataracts	Negative	Discission
30	Secondary cataracts	Mucus, leucocytes	Discission
5	Buphthalmia	Leucocytes, large diplococci	Iridectomy
20	Traumatic cataracts	Negative	Linear extraction
10	Traumatic cataracts	Leucocytes, cocci	Linear extraction
20	Traumatic cataracts	Small, large diplococci	Linear extraction
10	Zonular cataracts	Negative	Linear extraction
20	Congenital cataracts	Negative	Linear extraction
5	Morgagnian cataracts	Mucus, pus, diplococci	Extraction
120	Mature senile cataracts	Negative	Extraction
25	Mature senile cataracts	Pus, cells, no bacteria	Extraction
25	Mature senile cataracts	Leucocytes, occasional coccus	Extraction
10	Mature senile cataracts	Mucus, bacteria, leucocytes	Extraction
30	Mature senile cataracts	Epithelium, pseudo "K.L.B."	Extraction
20	Mature senile cataracts	Much mucus, no bacteria	Extraction
20	Mature senile cataracts	Mucus, diplococci, pus cells	Extraction
40	Mature senile cataracts	Leucocytes, no bacteria	Extraction
40	Mature senile cataracts	Mucus, staphylococci	Extraction
10	Mature senile cataracts	Pus, pneumococci, mucus	Extraction
5	Mature senile cataracts	Mucus, leucocytes, no bacteria	Extraction
10	Mature senile cataracts	Mucus, few cocci, no pus	Extraction
20	Mature senile cataracts	Leucocytes, large and small diplococci	Extraction
20	Mature senile cataracts	Pus, mucus, leucocytes	Extraction
20	Mature senile cataracts	Mucus, large and small diplococci	Extraction
20	Dislocated lens	Mucus, leucocytes, bacteria	Extraction
30	Complicated cataracts	Pus cells, mucus, bacteria	Extraction
4	Cyst of iris	Negative	Iridectomy
6	Detachment of retina	Negative	Trephine

SUMMARY.

If we are to improve our cataract results and have fewer post-operative infections, we must start at the bottom and not at the top. It is just as necessary for the ophthalmic surgeon to clean house, as it is for the general surgeon.

1. The arch enemy of the ophthalmic surgeon is oral sepsis. Patients must stand the acid test for focal infections, the "Three T's" (teeth, tonsils, and toxemia), before we will consider the operation. This applies to all patients except emergency cases. Wells, before the New England Dental Society, called attention, in no uncertain way, to the importance of going after oral and focal infections before attempting operations where the eyeball is opened.

2. I wish to express strong faith in silver nitrate as a germicide and irritant. In all of these 1250 cases, 1 per cent. silver nitrate was instilled into the eye two hours before the operation, and 25 per cent. solution of argyrol was used at the time of operation.

3. If a patient's eye looks clinically clean we operate. The so-called "senile catarrhs" are not looked upon as clinically unclean by us. We pay no attention to the findings of the bacteriologist. In fact, in private patients, I no longer take smears.

4. In analyzing our 1250 cases, we have three secondary infections, coming on nine days after the operation. One of these patients recovered and will have some vision: the other two developed chronic iridocyclitis. These patients had negative smears. We were able to trace these infections to faulty technique in reference to oral sepsis.

5. Case 1 and 2 occurred in the same patient. His smear showed pus and diplococci, mucus; also he had chronic dacryocystitis. The patient had chronic glaucoma with very little vision. I performed a Lagrange operation without bringing the tension down; in two weeks, another Lagrange operation was performed. No infection followed either of these operations. Doctor Stout was house surgeon at that time and assisted.

6. Vitreous humor was lost in four cataract cases. In case 55 a bead of vitreous humor appeared. The smear contained

pus and a number of diplococci. No infection resulted. Case 167 was a bad case of ozena; a smear showed pus cells and staphylococci. There was no infection. An iridectomy was performed in Case 280, after which a secondary membrane was removed. Some vitreous was lost. A smear showed considerable mucus and a few leucocytes and an occasional diplococcus. There was no infection. In Case 391, an iridectomy and capsulectomy were performed. Vitreous was lost; the smear showed pus, diplococci and mucus and no infection resulted. Case 518 presented a dislocated lens. Iridectomy and extraction of the lens were performed; considerable vitreous was lost in this case; the smear showed a few leucocytes and some bacteria—no infection resulted. In case 799, there was ozena. A smear showed leucocytes and large diplococci. No infection resulted. In case 897, the patient squeezed and lost considerable vitreous. The smear showed epithelium and pseudo K.L.B. No infection resulted.

7. Case 1150—Mr. H., age 68, with mature senile cataract, was referred to me by Doctor Emil Mayer. This patient had been troubled for years with an obstruction of the nasal duct. Probes had been passed into the duct from time to time. The canaliculi were still open, but no pus could be squeezed out of the sac. He had angina pectoris and would not submit to extirpation of sac. Doctor Mayer and I decided to undertake the extraction of the cataract with an extra dose of silver. One per cent. silver nitrate solution was used in his eye at 9 A.M. and again at 12 o'clock. At 2 P.M. the operation was performed, the patient sitting up in a chair on account of his heart. His eye was dressed every 24 hours on account of his lacrimal trouble. He got a beautiful eye with $\frac{3}{8}$ vision. The smear in his case, before the silver was instilled, showed pus cells, diplococci and mucus—but for its "watery" condition the eye looked clinically clean. Doctor David Robb was house surgeon on my division at "The Infirmary," and assisted me in this operation.

Case 1200 was a similar case in a woman, age 60, with lacrimal trouble of long duration. Her smear was negative and her eye looked clinically clean. I operated upon her as I did on Mr. H., using silver nitrate 1% at 9 A.M., and again

at 12 o'clock, and extracting the cataract at 2 P.M. Her eye was also dressed every day. Doctor H. V. Halbert was House Surgeon at the time, and assisted me. I mention Case 1, 2, 1150 and 1200 especially to show to you and to prove to you the great power silver nitrate has as a practical specific against infection. Of course, I am not advocating operating upon every cataract case that comes along which has serious trouble with the lacrimal apparatus without first performing an excision of the sac. But I do think, if the eye looks clinically clean and no fluid or secretion can be squeezed out of the sac, and 1% silver nitrate is used twice in the eye, and at four-hour intervals, it is perfectly safe to operate. Investigations made by Elsching and by other workers have proved that in the majority of cases, the conjunctival sac contains the pathogenic organisms.

8. In soft or lamella cataracts, I perform a peripheral linear incision with a flap just back of the limbus. Also in all discissions, I enter the anterior chamber through the conjunctiva and sclera, just back of the limbus. The same rule applies to hard cataracts. I make the section in the sclera just behind the limbus, always having in mind a conjunctival flap. I consider it *obsolete* to go through the cornea in performing discissions, soft or hard cataracts. Why attack the eye at its weakest point? The chances for infection are greatly increased by using the corneal route.

9. In our list of 1250 cases we operated upon 415 mature senile cataracts, 80 soft cataracts, and 30 complicated cataracts—making all told, 525 cataracts removed, with two eyes lost from secondary infections coming on nine days after the operation. Not a single case of primary infection or panophthalmitis resulted. We performed 125 discissions on soft and secondary cataracts, 480 iridectomies, 40 Lagrange, and 26 trephine operations, 30 DeWecker, and 24 miscellaneous operations without a single primary or secondary infection.

It is interesting to note that the ages of our patients ranged from two months to ninety years. Eight of our patients with cataract had three per cent. sugar in the urine. Sugar is no barrier to the operation unless it exceeds four per cent.

Duane (in seventh edition of Fuchs, page 846) in speaking of my method of preventing infections calls it "Artificial Pre-Operative Leucocytosis," and he further adds: "The good results obtained by this practice in eye operations seems well substantiated by statistics and the translator believes that it is based on sound theory."

ACTION OF SILVER NITRATE.

I know that silver nitrate furnished a marked degree of stimulation to the conjunctiva and in that way leucocytosis is produced. The silver promotes phagocytosis and the formation of antibodies, and in this way puts the tissues into a stronger state of defense against the invasion of micro-organisms. Even were an inflammation produced by the silver, it would only diminish the probability of infection, not increase it, because the leucocytes and their leukins are valuable means in combating bacteria. And what makes the phagocytes so active? It is the pre-operative removal of foci of infection—going after the "Three T's."

The thought has occurred, however, that this preventive effect of the silver salt may be at least in part due to the germicidal action of the silver, and in order to shed more light on the subject a series of 50 cases have been investigated by Doctor S. P. Oast and Mr. E. B. Burchell in the laboratory of the New York Eye and Ear Infirmary.

The following technique was employed on the patients admitted to "The Infirmary." A culture was taken from the conjunctiva. Then according to the author's technique, several drops of freshly prepared silver nitrate in 1% solution were instilled into the lower conjunctival cul-de-sac, and the eye left unprotected by a dressing of any sort. After a lapse of two hours, just before the operation, a culture was again taken in the same manner. The material was collected by means of a small platinum loop from the lower conjunctival cul-de-sac, care being taken to avoid contamination with the lids and cilia. This was transferred after the usual manner to agar starch which was incubated at 37° C. for twenty-four hours and then examined.

BACTERIOLOGICAL STUDIES.

<i>No. cases examined</i>	<i>Before</i>	<i>After</i>
3	Diplococci	No growth
3	" and Xerosis	No growth
4	Xerosis	No growth
5	Staphylococcus	No growth
1	Subtilis bacillus	Staphylococci
1	Xerosis and Diplococci	Xerosis and Diplococci
4	Staphylococcus	Staphylococcus
1	Xerosis and Staphylococcus	No growth
1	Xerosis	Xerosis
1	Streptococcus and Staphylococcus	Staphylococcus
1	Xerosis and Staphylococcus	Xerosis
23	No growth	No growth

We concede the generally accepted fact, that from a practical standpoint, it is impossible to sterilize the conjunctival cul-de-sac, and were this possible of accomplishment, even momentarily, by any anti-bactericidal agent, or method, at our command, as soon as the same had become neutralized or its action spent, infection would immediately recur from the lid margins and meibomian ducts which are constantly contaminating the conjunctiva with their germ-laden secretions. It will be noticed therefore, from the above study that there is but one case which shows, after the use of silver, the presence of any organism (diplococcus), not a normal inhabitant of the conjunctiva, or whose presence could not be accounted for by contamination in the above mentioned way. Close analysis of the above results will also show that in some of the cases different organisms were found before and after the use of silver, a circumstance which likewise adds weight to the view of constant contamination in the above-mentioned way.

The older ophthalmic surgeons and writers were extremely averse to the use of any actively germicidal agents in the conjunctival cul-de-sac just prior to the intraocular operations because of the usually attendant irritating qualities of such materials. They feared the catarrh produced by this irritation with its supposed concomitant increase in the number of bacteria, thereby favoring rather than diminishing the chances of infection. In the light of these present studies, not to mention the corroboration of our clinical experience, there

seems little ground for such assumption as regards at least one agent which is capable of very appreciable germ destroying power in vivo.

In the present series in cultures taken two hours after the use of silver, in every case, a point was made of obtaining some of the stringy purulent-like masses such as are familiar to all who have observed the effect of silver solution in the eye, and it was extremely interesting to observe that the cultures obtained in this way invariably yielded no growth, or a considerably diminished number of colonies. In addition to the silver being a powerful bactericide, I am strongly of the opinion that it increases the phagocytic power of body cells in and around the eye, producing a leucocytosis and leaving the eye protected during the healing process.

PREPARATION OF "THE SILVER."

The 1% solution of silver nitrate (5 grains to 1 oz. distilled water) should be made up fresh at least every three months, and must be kept in a dark glass-stoppered bottle. The rays of light cause the silver solution to become inert, and for that reason it should also be kept in a dark room.

Professor P. Knapp in an article (*Schweizerische, Medizinische Wochenschrift*, April, 1923, Basel) on Modern Cataract Operation, makes several observations concerning the use of AgNO_3 .

First he refers to the instillation of 1% to 2% silver nitrate immediately before the operation. The point of using the "silver" two hours before the operation, which is most important, he has overlooked. The two-hour interval gives the silver time to destroy bacteria and produce a leucocytosis.

His second objection was that the silver increases secretion with many bacteria. Our research work at the New York Eye and Ear Infirmary shows that the silver does increase the secretion but cultures of the stringy purulent-like masses showed that they invariably yielded no growth or a considerably diminished number of colonies. In other words, two hours after the instillation of the 1% silver nitrate in the eye, cultures from the secretion of cul-de-sac showed the absence of the bacteria in 82% of the cases, whereas before the silver

was instilled, the cultures were positive in 60% of the cases.

I feel that Professor Knapp is making the wrong application of a good principle. If he will use my technique with an open mind, I feel that he will be pleased with the results. Certainly my clinical results are overwhelming.

The following well-known ophthalmic surgeons in Greater New York are using "My Method" in their intraocular operations. W. E. Lambert, J. H. Ohly, P. C. Jameson, C. E. McDonnald, J. M. Wheeler, F. W. Shine, L. W. Crigler, A. Wiener, I. Hartshorn, B. W. Key, C. Berens, Jr., B. Samuels, E. V. Darling, T. A. Northcott, and J. H. Dunnington, I. Goldstein and K. Schlivek.

I want to express my thanks to the following members and ex-members of the House Staff for their coöperation and assistance:—Anthony, Peters, Stout, Blades, Richardson, Neff, Hicks, Shannon, Robb, Hogan, Hinsdale, Pierkey, Veasey, McGarvey, Oast, Frost, Lewis and Halpert. Also I want to express my thanks and great appreciation for Doctor S. P. Oast and Mr. E. B. Burchell for this excellent research work.

In addition to the 1250 cases—the subject of this paper, R. C. Heflebower of Cincinnati reports 300 intraocular operations performed according to "my method" without a single primary or secondary infection. Heflebower feels such a sense of security with "The Silver Nitrate," that he now no longer takes smears or cultures—reliance being placed in the efficacy of the preparatory treatment, and he adds, "The results have been most happy."

PRELIMINARY IRIDECTOMY OF PRIME IMPORTANCE.

1st—It is much safer for the patient's eye and better for the surgeon in the long run.

2nd—It protects the eye and leaves it stronger for the years to come.

3rd—If it is the "safe procedure" when a patient has one eye,—why is it not a good thing when he has two?

4th—Doing preliminary iridectomies in my clinic and in my private practice have become a "hard and fast rule" with me. This rule applies to all (hard, soft and juvenile) cataracts. It enables me with safety to the eye to do all my operations just

back of the limbus. I feel that it is a great mistake to use the corneal route in doing intraocular operations.

5th—Some operators and a few patients raise the objection to iridectomy on account of the necessity of making two trips to the hospital and because the danger of infection is doubled by a two-step operation. W. F. Hardy says, and he is quite correct, that the operator raises these objections in his own mind much oftener than does the patient, and he adds "if an ophthalmologist is thoroughly convinced that a certain line of action is the correct one, he will have little trouble in putting that conviction over to the patient and gaining his consent." As far as the extra chance for infection is concerned, I feel that I have been able to eliminate that argument.

6th—I agree with Darrier and Hardy who are strong advocates of preliminary iridectomy.

7th—If you want every cataract operation to be successful, then I advise "my technique," and a preliminary iridectomy. I hold and believe that it is the only way to get a good surgical result in every case. These are the conclusions that I have reached after doing cataract work for over twenty years.

THE TREATMENT OF SOME FORMS OF DERMOID AND OTHER CYSTS WITH TRICHLORACETIC ACID.

BY DR. H. GIFFORD, UNIVERSITY OF NEBRASKA, OMAHA.

SEVERAL years ago, in discussing the treatment of blood cysts of the orbit,¹ I stated that if I should again encounter one of those dermoid cysts which send a prolongation of the cavity deeply into the orbit, I should be inclined, instead of trying to dissect this out, to destroy its epithelial lining with trichloroacetic acid. In the intervening period I have had five cases of dermoid cysts, and two so-called oil-cysts (like the one recently reported by Arnold Knapp),² in which this treatment has been tried with perfect success.

CASE I. Robert P., aged 19; has noticed a tumor in the upper angle of the right orbit for many years but he thinks it is slowly getting larger. It is not painful but he notices that it seems larger when he catches cold. Examination shows a tumor nearly an inch in diameter just above the tendo-oculi. This recedes slightly on pressure but on deeper pressure is found to be firmly attached to the inner wall of the orbit and to be free from the superior wall. Examination of the nasal cavity shows nothing noteworthy. Under general anæsthesia, the skin was incised and a fixation thread was passed through the wall of the tumor. The latter was then opened, revealing a cavity about one inch in breadth and one and one-half inches in depth, full of broken down epithelium. This was swabbed out carefully and liquified full-strength trichloroacetic applied freely and thoroughly to the interior of the sac. The external wound was completely closed and healed without any reaction. Seven months later he writes that the swelling is practically

¹ *American Journal of Ophthalmology* (New series), Vol. i., p. 625.

² *Archives of Ophthalmology*, Vol. lii., No. 2, March, 1923, p. 163.

gone and the scar is hardly noticeable. He also adds that a lacrimation which had bothered him for years (but which he had not mentioned on his first visit) has entirely disappeared. He was urged to write me again if there were any signs of a recurrence at any time, but I have not heard from him since.

Just as good a result *might* have been obtained by excision but this would have been decidedly more difficult and would have involved some risk of injuring the superior oblique.

CASE 2. A woman about twenty years old (whose case card I have not found on account of faulty indexing) came to me for a tumor about three-fourths inch broad, extending from the zygoma for about two inches straight down, immediately in front of the right tragus. This was rather closely attached to the skin but deeper in it was tolerably moveable. I felt that there would be some risk, in dissecting it out, of injuring some vessel, nerve, or duct, without advantage to the patient; so I made a horizontal incision about one-fourth inch long at the upper extremity of the tumor and evacuated a large quantity of characteristic dermoid substance. The cavity was then treated as in Case 1, several drops of the liquified trichloroacetic being injected deeply down into the cavity with a long-pointed dropper, before the swabbing process was begun. The wound healed without reaction and I have heard nothing more from her during the ensuing years. This I take to be a good sign as she lives only a few miles away.

Three other rather superficial dermoids from one-fourth to one inch in diameter have been treated in the same way, with perfect results in two, while in the third, the wound failed to close by first intention, and a slight watery discharge persisted for several days, the eventual result being perfectly good. The last three tumors might just as well have been excised, the last one, in fact, being good evidence that where the cavity does not penetrate deeply, the excision is preferable.

CASE 6.—Martha C., aged 19; lost left eye when three years of age from a cut with glass. For the past two months has noticed a growth in the upper inner angle of the left orbit which has pushed the artificial eye out and caused headaches. On examination a tumor apparently about one-fourth inch in diameter was found in the upper inner angle of the orbit. An incision was made through the skin about five-eighths inch long, exposing a cavity about one inch in diameter, filled with a slightly syrupy, perfectly clear, light straw-colored fluid. This led back along the inner wall of

the orbit but no bare bone was found nor any connection with any other cavity. Trichloracetic acid was applied and the cavity packed with aristol. On the fifth day the wound was sutured, although there was still a good deal of aristol in the cavity; and she returned to her home in a neighboring city. Her family physician wrote me, two weeks later, that the stitches came out after a few days and a good deal of pus came from the cavity for several days but then it healed completely, with a very inconspicuous scar.

The operation was done a year and a half ago and she has had no further trouble. I must confess that I cannot remember why I did not close this wound without packing, as I had done in the other cases.

CASE 7.—This case is practically a twin to Case 6. The patient Miss M. L., aged 28, has a tumor at the inner angle of the right orbit. This was noticed when she was a year old and has been very slowly increasing in size. Has been somewhat painful at times. Three years ago she was struck in this region with an elbow, after which it has increased more rapidly.

Examination shows a small xanthelasma in the skin of the upper inner orbital region on the surface of a roundish tumor about three-fourths inch in diameter. This is firm and elastic and does not reduce on pressure. Tear passages normal. The tumor transilluminates readily when light is thrown through the skin at the side. Tumor was opened and proved to be a so-called oil-cyst, precisely like that in Case 6. There were no signs of the ordinary epidermal debris except at the extreme inner end of the cavity where epithelial-like stuff showing no structures under the microscope, was dug out with a vigorous application of a swab. This was somewhat pinkish, not of the yellowish-white color found in dermoids. The cavity was about an inch in depth and three-fourths inch in diameter, reaching along the inner wall of the orbit to which its wall was closely attached. This was swabbed as clean as possible and the cavity packed to stop bleeding. Packing then was removed and several drops of trichloracetic acid injected into it; the walls thoroughly scrubbed again with the acid; a little aristol was introduced into the cavity and the opening closed with three sutures. Healing was by first intention. When seen May 1, 1923, the wound was hardly perceptible and she had had no pain since the operation.

The idea of closing dermoid cysts by destroying their lining is not new. So far as I can learn the only substances that

have been used for this purpose have been tincture of iodine, nitrate of silver, or a mixture of iodine with 10% carbolic. The rare references which I have found to this treatment in text books are apparently based more upon tradition than upon experience. The great majority of books which I have consulted speak merely of excision, under the head of treatment.

Conclusions.—Dermoids and other cysts, the excision of which involves some risk of injuring important structures, may safely and effectively be treated by destroying the lining with trichloroacetic or some other caustic. Where such cysts are entirely superficial, simple excision with thread fixation is to be preferred. There is no reason why the cauterization method should not be combined with excision, as I suggested in my blood-cyst paper; the prominent, easily accessible portions of the cyst being excised, while the remainder is cauterized.

CONGENITAL OCULO-FACIAL PARALYSIS.¹

By DR. DANIEL B. KIRBY, NEW YORK CITY.

THE complexities of the oculo-motor mechanism would easily admit of a great number of congenital defects. However, cases showing agenesis or abiotrophy of portions of this apparatus are comparatively rare. It is our purpose to present a patient with bilateral oculo-facial paralysis, most probably congenital, and to review a few analogous cases.

Patient, male, age 52, has never been able to close his eyelids nor to move his eyes to either side. He is the youngest of ten children, all others being entirely normal. Birth was normal but the inability to close the eyes, or to move the eyes to either side and the expressionless face were noted from early infancy.

Twelve years ago he contracted lues and did not receive proper treatment. In November, 1922, because of ataxic condition, he fell down a flight of steps and suffered lacerations about the left eye and fracture of the outer plate of left frontal sinus. This brought him to my care at Bellevue Hospital on the service of Dr. Charles H. May. The lacerations healed rapidly and no untoward result came from the fracture. The presence of lues was confirmed by Blood Wassermann 2+, Spinal Fluid Wassermann 4+, Colloidal Gold 0001221000. The interesting muscular anomalies were noted and diagnosis confirmed while in the hospital by Dr. Foster Kennedy.

He has been receiving anti-luetic treatment since and the tabetic symptoms have abated somewhat, but otherwise he presents the same phenomena now that he did then.

Status Præsens—

Vision O.D. $\frac{2}{8}$ accepts +1.00 Sph. \odot +2.75 C. ax 30 $\frac{2}{8}$
“ O.S. $\frac{2}{8}$ “ +1.25 Sph. \odot +4.50 C. ax 135 $\frac{2}{8}$

¹ Case presented before Ophthalmic Section, New York Academy of Medicine, April, 1923.

He is unable to elevate his brows. He is unable to close his eyelids. On the attempt to do this, the globes are rotated upwards and inwards. There is marked ectropion of both lower lids. With the eyes directed at a distant object there is present, esotropia of about 10° of arc with right hypertropia of about 3° of arc with the left eye fixing. When the fixing eye is covered, the right eye will take up fixation, intorsion and depression being observed. When the left eye is released from cover, it will resume fixation by elevation and extorsion.

There is no evidence of action of either external rectus. Patient is unable to rotate either eye outward. Vestibular tests carried out by Dr. J. Swift Hanley indicated activity of both labyrinths but did not produce any external rotation of globes nor any nystagmus in the horizontal plane.

When commanded to move his eyes from side to side, the patient is unable to move them. When an object is carried in a horizontal plane at a distance of 20 feet, he is unable to follow it with either eye, when the head is fixed, only shift of fixation from one eye to another at the mid-line being noted. When the object is carried at near range to the right, the left eye follows it through an arc of 10° . To the left, the right eye does likewise. When a distant object is fixed by the eye and the head passively rotated to the right, the right eye maintains fixation through an arc of 25° . On rotation to the left the left eye does likewise through an arc of 20° . Similar results for near range. There apparently is, in this case a greater ability to move the eyes in response to lower reflex control of associated movements than to those of the higher centers.

The patient is able to converge although this power is less than normal. He is unable to relax this convergence and to return to his primary position. Inasmuch as all associated movements within near range have also the added phenomenon of convergence, it was necessary to differentiate. While one eye was occluded by a screen and the other eye was called upon to follow the object in movement of adduction, the covered eye remained stationary. Both pupils reacted to convergence in the act. The same was true when the opposite eye was tested in like manner. He can elevate each eye and depress them normally in a single vertical plane concomitantly and without any torsion. Diplopia has never been experienced, nor has it been induced.

Pupils are unequal, irregular, do not react to light, either direct or indirect, but do react to accommodation, both monocular and binocular, and to convergence.

Media show a few vitreous opacities. Fundi-disks ill-defined, slightly paler than normal, no abnormal elevation

nor depression. Slight evidence of vascular thickening. Fields show slight concentric contraction.

Other neurological findings as found by Dr. Foster Kennedy at Bellevue Hospital and by Drs. Wechsler and Rubinowitz at Vanderbilt Clinic were: I, VIII, IX, X, and XI cranial nerves normal. VII showed a bilateral facial atrophy of the greater number of muscles supplied by both the upper and lower divisions of the facial nerves. Electrical tests conducted by Dr. Evan Evans elicited no response to any form of stimulation in the right or left frontales, corrugatores, orbiculares oculi or orbiculares oris, quadrati labii inferioris, or of the menti. The right and left quadrati labii superioris and right and left zygomatici responded to 0.4 M.F. The XII showed a bilateral paresis. The tongue deviated to the left, cannot be moved upwards. Lateral movements fair. A deep median furrow with other minor furrows indicated atrophy of some of the intrinsic muscles of the tongue, especially the superior longitudinal fibers. Direct stimulation of the tongue gave response to 0.4 M.F. Talipes Equino-varus of moderate degree on the right side.

Evidence of neuro-lues was shown by the following: Argyll Robertson pupils, absent patellar and Achilles tendon reflexes, ataxia of lower extremities with positive Romberg, variable tactile sensory changes in lower extremities.

Summary.—History of inability to move eyes to either side, or to close the eyes and difficulty with movements of tongue from earliest period of life with later contraction of lues in 1911 and onset of tabes dorsalis.

Etiology.—The neuro-lues needs no discussion here, but the earlier condition most probably represents an agenesis or abiotrophy of the several cranial nerve nuclei. It is necessary also to consider an inflammatory process occurring very early in life either in the nature of an encephalitis or vascular injury in the region of the VI nerve nuclei, affecting the contiguous loop of the VII nerves, with an affection of the XII nuclei and possibly the posterior longitudinal bundle, but the peculiar distribution militates against such a cause.

In 1897 Leszynsky (1) presented a case of congenital absence of outward movements of both eyes but with retention of

convergence and of lateral adduction of either eye. He referred to an analysis by Kunn (2) in 1895 of nine cases of bilateral abducens paralysis, and with few exceptions these were associated with bilateral facial paralysis of the nuclear or infranuclear type.

Cases which were analogous to that of the author, *i.e.*, in presenting paralysis of both abducens and facial nerves with other features have been reported by:

Graefe (3), whose patient, a male age 20 years, showed also absence of sense of smelling and taste.

Kahlmeter (4) has recorded a case of bilateral facial and abducens paralysis as also did Harlan (5) in the case of a boy 18 years of age without remarking on any additional features.

Chisolm (6) observed a woman age 35 who showed in addition, the absence of both carunculæ lachrymales.

Möbius (7) has written of a man 59 years old who also showed paresis of both inferior recti and the presence of webbed fingers.

Fryer (8) has given us the case of a youth of 16 who had also absence of associated lateral movements, absence of the right hand and incomplete development of the right upper extremity.

Schmidt (9) recorded the case of a boy 6 years of age who had also disturbances in the hypoglossal nerve; the fact that the recti interni acted well in convergence and in lateral adduction was also remarked.

Procopovici's (10) case of a girl age $7\frac{1}{2}$ years showed the absence of the facials and abducens but was able to use the interni well in convergence and in associated lateral movements.

Lennon (11) has given us two cases, one of a male child 2 years old who had also diastasis of the abdominal recti muscles, and the other, a boy age 14 with also club feet and hypoplasia of the right arm and hand.

Economo (12) reported a case of Güterman's, a boy of 6 with also associated paresis of the lingual portion of the right hypoglossal, with epicanthus and malformation of caruncles, trunk and fingers.

Warrington (13) presented a case which showed absence of function of both abducens but with a unilateral facial paralysis.

Not entirely analogous but sufficiently of interest to be

recorded in this connection are cases of congenital absence of both external recti, without loss of function of the facials as in the cases recorded by Leszynsky (1), Lamhofer and Möbius (14), Günsberg (15), Kunn (16), and MacKinlay (17), the last mentioned recording also that the function of convergence was retained.

In this connection also should be recalled those cases exhibiting the bilateral retraction syndrome due to the congenital absence of muscle tissue in the external recti and its replacement by fibrous tissue. This subject has been ably reviewed by Duane (18) in 1905 and more cases are continually being recognized and found in the literature since attention was directed to them.

Etiology.—In regard to the underlying causes of such cases as are analogous to the author's, different opinions have been expressed, not however contradicting each other, but indicative of the conditions found in the individual cases.

The two main classes may be considered as

(a) Those in which there exists a primary aplasia of the muscle, due to a mesodermic defect, the embryonic foundation for the muscle not being laid down. There is sufficient evidence that this occurs, for Schenkl (19) as quoted by Lennon, (11), reported a case of ophthalmoplegia, in which the muscles were absent, while the nerves and ganglion cells were intact at autopsy. Obersteiner (20) examined the cord of a man who lacked from birth, muscles of the right shoulder girdle and at post-mortem examination found intact corresponding anterior horn cells. McDannald (21) and Mittendorf (22) have recorded cases of absence of ocular muscles as demonstrated at time of operation.

(b) The other cause considered is an ectodermic defect.

1. Those cases in which the muscle was laid down but underwent degeneration during the embryonic period because the normal connection with the nerve or central organ was never established.
2. Lack of development of the nerve.
3. Lack of, or defective development of the cells of the nucleus.

Gowers (23) referred to this class of cases and without pathological evidence at the time, stated that the history suggested defective vital endurance in the nuclear structures.

He placed them in the class of abiotrophy as later defined by Collins (24).

A case which was inferred to be central was cited by Lagrange (25) who by carefully tested electrical reactions, demonstrated that the seventh nerve lesion was central and deduced from this fact that the abducens-paralysis was likewise central. Electrical reactions have not as yet helped to solve the location of the lesion in ocular muscle paralysis.

A case in which the cause has been clearly demonstrated to have been due to aplasia of the nuclear structures has been cited by Heubner (26) who in 1900 described a child age 2 years, with paralysis of both external recti and facials and atrophy of the left anterior half of the tongue. Histological examination showed complete absence of the cells of the abducens nuclei. The facial and hypoglossal nuclei on the left side were practically absent and on the right side the facial nucleus was represented by a diminished number of cells. The nerve roots were very small or absent. The left posterior longitudinal bundle was poorly developed. The conclusion was that the lesion was due to nuclear aplasia or agenesis.

In regarding the author's case as congenital, care has been exercised to consider also paralysees occurring after birth either due to abiotrophy as defined by Collins (24), the condition in which a structure apparently normal at birth degenerated through lack of vital endurance, as also the cases of paralysis occurring early in life, as for example, the case reported by Thompson (27), female age 2 years, whose right eye suddenly turned inwards at the age of 18 months, and was followed by the turning in of the left eye ten days later. Paralysis of the right facial was observed in ten days and two weeks later inability to open the mouth. At the time of the report there was present, complete paralysis of both abducens and of both facials, affecting more greatly the lower facial group. Wilbrand and Saenger (28) have demonstrated another case in which there was degeneration of the right abducens nucleus and of a group of cells lying between this and the right seventh nucleus.

However, the absence of the anterior horn cells or of the cells of the cranial nerve nuclei is not absolutely conclusive of nuclear agenesis, as consecutive atrophy of the nerve and

anterior horn cells may occur as was found by Edinger (29), (quoted by Lennon) in the case of a man who suffered an intrauterine amputation of the forearm. Möbius held that neural atrophy in this type of ophthalmoplegia was secondary to the muscular defect, but subsequently changed his view.

SUMMARY.

1. Congenital oculo-facial defects occur
 - (A) due to mesodermic defect or aplasia of nucleus or nerve or (B) lack of union of nerve with muscle.
2. The nuclear defect has been demonstrated as existing in Heubner's case and others.
3. The author's case probably is analogous and represents an agenesis of the nuclear structures of the VI, VII and XII cranial nerves.

Acknowledgments are gratefully made to Doctors Alexander Duane and John M. Wheeler and to others whose names appear in the paper for their assistance in studying this case.

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MY EXPERIENCES IN WORKING WITH DR. BARRAQUER IN BARCELONA.¹

BY DR. WILLIAM MCLEAN, NEW YORK.

THE first writings by Dr. Barraquer in relation to his operation which he has named Phacæresis, that I have been able to discover were in 1917. Since then he has written quite extensively both in Spanish and in French. When I first read his articles I was much impressed with his manner of extracting the crystalline lens, as previous to my work on the tonometer, I spent considerable thought in an effort to devise a method of removing the hard cataractous lens, employing traction instead of the prevailing method of expression. My thoughts lead to the employment of suction, but I was not considering removal of the lens in its capsule, and I had not successfully worked out a plan along that line before I became interested in an effort to perfect the prevailing methods of tonometry.

Dr. Barraquer was not the first to endeavor to make obsolete the removal of the cataractous lens by expression. Since the early days of cataract extraction we find, creeping into ophthalmic literature, descriptions of methods of operating which would avoid the process of expression in removing the lens from the eye. Pagenstecker attempted to use a curette to lift the lens from the eye, and others have tried to get away from the element of expression in cataract work.

When Dr. Barraquer was in this country last April I had the good fortune of meeting him through the courtesy of Col. Elliot, and Dr. Barraquer consented to demonstrate his operation before the staff of the New York Ophthalmic Hospital. It was my privilege to assist him at one of the operations.

¹ Read before the Brooklyn Ophthalmological Society, Dec. 21, 1922.

This gave me the opportunity of seeing the operation at close range and also demonstrated to me the folly of attempting to master the technic of phacocesis without the guidance of the author to carry me safely over the many little intricacies and pitfalls, the avoidance of which tends to make for the success of the operation. Only when one works with Dr. Barraquer in Barcelona can he realize the dangers lurking in his pathway had he attempted to work out successfully the technic of Dr. Barraquer. Dr. Barraquer was kind enough to urge me to make the journey to Barcelona where I could avail myself of his teaching facilities, so last summer I spent three weeks working with him.

Dr. Barraquer is Professor of Ophthalmology in the Medical Department of the University of Barcelona, and as such he is Chief of the Dept. of Ophthalmology of a very large municipal hospital. He has access to the autopsy material for ophthalmic purposes of this very large general hospital and it is possible to obtain the eyes of all the patients who succumb in the hospital.

The method of teaching he employed with me was to utilize the freshly enucleated eyes of the recently deceased patients. Because of this wealth of material he has ample good teaching facilities and in this manner I was able to follow his instructions and, by his criticism, develop a technic satisfactory to him. It was not until then that I did operations on the living. Instruction was given in every little detail, and it is the details in this operation that spell either success or failure.

The cataract patients coming under Dr. Barraquer's service are examined very carefully before operation. Urinalyses and physicals are done on each patient. The eye and its adnexa are examined and the type of cataract determined. By type, I mean, not the hard or soft, nuclear or cortical designations as we are accustomed to classify them, but the hard, smooth, evenly grained types, those containing soft areas, and those containing the so-called vacuoles. This designation is possible only with the corneal microscope and slit lamp, and it is with this apparatus that Dr. Barraquer determines the degree of vacuum or negative pressure to employ. The vacuum ranges from 45cm of mercury in the softest types to 65cm in the hardest cataracts. The hardest and most evenly grained types

of cataract are the easiest to extract, and are those in which the best results are obtained, other conditions being equal.

I have used the term "corneal microscope" to designate this binocular microscope used in connection with the slit lamp. It is true that that is the term commonly used for this microscope and when it was designed, the examination of the cornea was its chief use. After Professor Gulstrand designed and perfected the slit lamp the uses to which this binocular microscope could be employed increased greatly. The iris and lens structures may be studied excellently, and with the assistance of "contact glasses" the angle of the anterior chamber and the vitreous body and retina may be studied under considerable magnification. Because of these added uses to which this microscope may be put, I believe we should drop the word "corneal" and call this instrument a "binocular microscope" since it is more than a "corneal microscope." Its binocular feature has considerable advantage over a monocular microscope, as it gives a sense of perspective when examining the interior of the eye.

With sufficient magnification the crystalline lens assumes an entirely different appearance than when examined with the ophthalmoscope or loop. The mature or immature cataracts as judged by oblique illumination assume very different aspects. The lens which we judge mature and ready for extraction by the Graefe method, when seen with the microscope and slit lamp may present a smooth evenly grained appearance, and as such the highest degree of vacuum applicable would work best. If this mature cataract should present small vacuoles, the degree of vacuum should be regulated to a lessened amount. When large liquifaction spaces are seen in the anterior segments of the lens close to the capsule, a minimum of vacuum that will hold the lens in the grip of the ventouse is used. This minimum ranges around 45cm of mercury.

The apparatus by which the vacuum is maintained is a rotary suction pump which is run by an electric motor. The pump runs in a bath of oil, and to the outlet of the pump is attached a piece of rubber tubing the walls of which are of sufficient resistance to prevent collapse. The terminal end of this tubing is attached to the handpiece. Along the line connected to this tubing is a vacuum gauge and a regulator

to govern the amount of vacuum. The hand piece or ventouse is an important part of the apparatus. It contains a valve which is under the control of the ball of the thumb. The tip of the ventouse is of platinum tubing, and the end of the tip is shaped like a tiny spoon with a reinforcement along its edge. The surface of this reinforcement is of the same curvature as the anterior surface of the crystalline lens.

It is essential that the whole suction apparatus be working in perfect order. The valve of the ventouse must not leak, and the guage must be registering a constant steady vacuum of the proper degree for that individual case under operation. In an apparatus where the valve is leaking, suction will occur before the tip of the ventouse is in proper position, and also in such a case, where the regulator is adjusted to maintain correctly the proper vacuum, the vacuum will be increased above the proper amount as soon as the ventouse is applied and the valve opened. Such an improperly acting valve might result in a ruptured capsule as soon as the suction is applied.

Another important feature of a correctly operating pump is to have the strength and rate of vibrations just sufficient to rupture the zonula at the periphery of the crystalline lens. If the vibrations imparted to the air column at the tip of the ventouse are too slow or too strong, traction will be transmitted along the length of the zonular fibers to the ciliary body. Such traction occurs during the Smith-Indian and Knapp intra-capsular operations, and Dr. Barraquer believes this traction to be a deterrent factor in these operations. Dr. Barraquer has arranged the stroke of the piston of the pump and the speed just sufficient to break the crystalline end of the zonular fibers. We examined several extracted lenses to make sure that the rupture of the zonule was occurring at the proper place. When others alter the technic of Barraquer by using a tip without a valve or by moving the valve a long distance from the tip so as to use a foot operated valve, an alteration occurs, and operators should study the results of such a change in technic to be sure that the correct principle is still operating in the altered apparatus.

I noticed the description written by another Spanish oculist, Dr. F. Munoz Urra, in a French journal, of an ingenious apparatus by which he imitates the vacuum of the Barraquer

pump. The principle involved in this apparatus employs the expansive and contractive forces of heat and cold. This comparatively simple apparatus consists of a metal tank which is partly filled with water. To the outlet of this tank is fitted a rubber tube with stop-cock. With this stop-cock open the tank is heated by a spirit lamp until the water boils vigorously. The stop-cock is now closed and the tank plunged into cold water. The contractile force of the cold produces a vacuum sufficient to perform the operation of phacæresis. This apparatus does not utilize a prominent feature of the pump, namely, vibration.

Dr. Marbaix of France, to avoid the slight noise of the pump, produces a vacuum by previously exhausting the air from a comparatively large chamber. A manometer which registers the state of vacuum is connected to this chamber. In this apparatus also the vibration is absent.

Dr. Gallemaerts of Brussels made some experiments in answer to the question raised as to whether the vibrations produced by the pump were carried to the crystalline lens. These experiments carried out in a physics laboratory, by tracings on a moving smoke drum, proved unquestionably that a vibration of the crystalline lens does occur. Other experiments have proved that this vibration breaks the zonule at the crystalline end of the fibers.

Dr. Barraquer in his cataract work has one complete set of instruments freshly sterilized for each patient to be operated on. Each set is arranged in a neat compact metal box with removable cover. This box with its set of instruments is enclosed loosely in a paper envelope. In this envelope it has been previously sterilized by dry heat, and the seal is not broken until everything is in readiness for the operation to proceed. Then the operating room nurse tears off the end of the envelope and slides the metal box out on the tray without contamination. The assistant removes the cover and arranges the instruments always in the same order.

The set contains—1 Panas cataract knife with double cutting edge.

1 Demarres lid elevator

1 Barraquer iris forceps

- I Barraquer iris scissors
- I Iris spatula
- I Landolt fixation forceps
- I Needle holder without lock

Needles and thread are sterilized separately and are in another container.

The cleansing and disinfection of the eyelids and surrounding parts having been done in preparation for the operation, the instillation of the mydriatic and anæsthetic begins one hour previous to operation. For this purpose a combination ointment of cocaine and euphthalmine is used. Instillations of this ointment into the inferior conjunctival sac are made every ten minutes for one hour, and the patient then comes to the operating table. On the table the patient is given an hypodermic of novocaine along those branches of the facial nerve so as to paralyze, temporarily, the action of the orbicularis according to the method of von Lindt. The face is then covered with sterile gauze leaving both eyes exposed. Both operator and assistant now put on sterile white cotton gloves.

The assistant is seated at Dr. Barraquer's right, and raises the upper eyelid away from the eyeball with the Demarres lid elevator. The lower lid is held away from the eyeball by the thumb of the assistant's other hand. With Landolt forceps the operator causes fixation without pressure by grasping the conjunctiva and sclera about 2mm from the limbus at its lower part. With the cataract knife the puncture and counter-puncture are made so as to include slightly less than one half the circumference of the cornea. Particular attention is given to the making of the incision so that its under surface will give the largest possible smooth aperture, and the upper third is made with a conjunctival flap. This conjunctival flap is next turned down over the cornea and the Barraquer iris forceps and scissors are introduced at the tip of the wound above, and the smallest possible peripheral iridectomy is made without bringing the iris out of the eye. The two conjunctival sutures are next placed and one twist of the knot of each is made. These sutures are put out of the way one on each side of the eyeball.

The motor of the suction pump is now started and the

operator takes the erisiphake in his hand very much as one would hold a pen, the ball of the thumb operating the valve. With the suction constantly at the desired level and the valve closed, the tip of the erisiphake is introduced into the anterior chamber, and without touching the iris, the tip is placed a little beyond the center of the lens and the valve opened. At the instant the valve is opened it will be noticed that the lens is gripped in the tip of the ventouse. Immediately the operator starts to roll the lens out of the patellar fossa by a steady rotating motion without producing the slightest pressure on the vitreous. The lens is thus removed from the eye upside down as it were. The small peripheral iridectomy has allowed the air to follow in the wake of the extracted lens, and so no suction or vacuum is produced in the patellar fossa, which is an important factor. The conjunctival sutures are now tied and, if necessary, stroking of the lips of the wound is done to place everything in proper apposition. Manipulation of the iris is rarely necessary, but should the pupil be out of position or uneven, the iris is gently stroked into place, the spatula being inserted into the wound along the side.

Eserine ointment is now instilled into the conjunctival sac and a light pressure bandage applied to both eyes. The patient is allowed to sit up, step down from the table, and walk to his bed. If the patient has been operated with his clothes on, and many of them were operated fully clothed, he is expected to remove his clothes within the next two hours and go to bed.

In those cases where everything was perfect and the operation passed without incident, the original bandage would not be disturbed for five days, although the patient would be allowed up out of bed before that time. Others would be examined sooner according to the exigencies of the case.

On the fifth day the bandage is removed sufficiently to examine the eye to note the reformation of the anterior chamber, the position of the iris, and the general appearance of the eye. It was astonishing how free from redness these eyes would be, and also the clearness of vision of the operated eye on its first examination.

Since I returned I wrote Dr. Barraquer asking for statistics of the cases operated while I was in Barcelona and he was kind

enough to send them to me. Arranged in percentages they are as follows:

25%	had vision	=	1.	or	$\frac{20}{20}$
10%	" "	=	.9	"	$\frac{20}{20}$
20%	" "	=	.8	"	$\frac{20}{25}$
15%	" "	=	.6	"	$\frac{20}{35}$
10%	" "	=	.5	"	$\frac{20}{40}$
5%	" "	=	.4	"	$\frac{20}{50}$
5%	" "	=	.3	"	$\frac{20}{65}$
10%	" "	=	.2	"	$\frac{20}{100}$

These tests were made mostly on the 15th day following the operation. Thus on the 15th day 52% had a vision of .8 or better. 76% on the 15th day had a vision of .5 or better.

The complications that would arise are mostly due to a faulty technic. If the amount of vacuum used is too strong for that particular lens, a rupture of the capsule may occur. If it occurs as soon as the vacuum is applied and while the lens is in its patellar fossa, it may be impossible to lift the lens from the eye and in that case the operator should cease working with the erisiphake and remove the lens by the usual expression method. If the rupture occurs as the lens is near its exit from the eyeball, the operation should proceed and the lens débris be stroked from the anterior chamber before the sutures are tied. If the vacuum is insufficient to cause the tip of the ventouse to adhere to the lens, or if the tip is improperly placed, a sucking noise will be instantly heard when the vacuum is applied. The valve should then be immediately closed. If it is ascertained that the tip is improperly applied, a correction should be made and another attempt made at removal. Should the vacuum be insufficient an adjustment of the vacuum by the regulator may be made and the operation proceed.

The presentation of vitreous would be an indication of pressure on the eyeball, unless it would be one of those rare cases of choroidal hemorrhage induced in sclerosed vessels through the sudden reduction of intraocular pressure. Such an hemorrhage occurred in one case operated by Dr. Barraquer while he was in America and I was told an enucleation became necessary. I believe such an hemorrhage would have

occurred no matter what method of extraction had been used as the expulsive hemorrhage occurred before any attempt had been made to introduce the erisiphake.

The main object of this operation is to remove the cataractous lens in its capsule without exerting pressure on the vitreous body so as not to cause a rupture of the hyaloid membrane, as occurs so frequently in the Smith-Indian method. Not one of the cases that had been operated by phacæresis, that I examined with the binocular microscope while I was in Barcelona presented an hernia of the vitreous. One patient I examined had had a cataract operation on each eye, one eye by the Smith-Indian method and the other by phacæresis. In the eye operated by the Smith-Indian method there was vitreous hernia, but it was absent in the eye on which the phacæresis method had been used. When the vitreous presents it should be treated in the same manner as with any other cataract operation. Iritis is less frequent than where the capsulotomy method is used. Dr. Barraquer says that iritis is rarely present if the operation proceeds without incident. A striped keratitis may be present at the first dressing, but it is usually insignificant and disappears without any special treatment before the patient is ready to leave the hospital. This striped keratitis is probably induced by the erisiphake coming in contact with the endothelial cells of the cornea.

Complications following the phacæresis method are less than by the Smith-Indian or capsulotomy methods of extraction. It is an operation requiring great dexterity, but not more difficult than the expression method.

Prof. Gallemaerts of Brussels says, the erisiphake of Barraquer does away with the pressure on the vitreous body which is so brutal in the operation of Smith. The results give great satisfaction, no irritation, a black pupil, excellent vision, and above all, no secondary cataract to be reckoned with.

In closing I would say to all those intending to adopt the operation of Barraquer, as Prof. Gallemaerts has said, "one should not attempt to do the operation without first having made a pilgrimage to Barcelona."

A DERMOID OF THE CORNEA.

By DR. T. HARRISON BUTLER, BIRMINGHAM, ENGLAND.

(With one illustration on Text-Plate XXXIII.)

THE general appearance of the condition to be described is shown by the drawing which was made by my House Surgeon, Mr. G. B. Lowe. The Case History is as follows:

Miss D. F., aged 19, came to the Birmingham Eye Hospital on February 14, 1922, complaining that something was growing upon her left eye. It had been noticed for a month, and had rapidly reached its present size. There had never been any redness of the eye, and no pain.

The patient is a decidedly good-looking healthy brunette well under the average in height and weight.

On the outer aspect of the cornea, and somewhat invading the sclera there is a flat, yellowish white, somewhat raised, patch. It is about 6mm in diameter, and is very slightly injected on its scleral aspect.

The vision of each eye was $\frac{3}{4}$ ths, and the fundi were normal.

The general aspect of the growth suggested a dermoid cyst, but the short history was strongly against this view. I interviewed the mother and brother and both were certain that the eye was originally normal in appearance, and that the growth was of recent development. It was inherently improbable that a young good-looking girl would have an unsightly excrescence upon her eye and not be aware of it.

I had about a year previously seen a similar condition in another young girl, which, commencing like a large phlyctenule, began to invade the cornea. This was undoubtedly a malignant growth, and was completely cured with the maintenance of full vision by treatment with radium at the Radium Institute in London.

I got my colleague, Mr. Jameson Evans, to see the case, and we concluded that the most likely diagnosis was malignant growth of the cornea.

On Feb. 27, 1922, Miss F. went to London to the Radium

Institute with the object of having the growth irradiated. The authorities there, however, had some doubt about the true nature of the case, and they asked their ophthalmologist Mr. Holmes Spicer to see the case. He formed the definite opinion that it was a congenital dermoid cyst, and she was sent back to me.

On April 4, 1922, I showed the case to a Joint Meeting of the Midland and the South Western Ophthalmological Societies. She was examined by a large number of well-known Ophthalmic Surgeons, including Mr. Richardson Cross, and her case was fully discussed. Three diagnoses were considered: it might be malignant; it might be inflammatory, perhaps tuberculous; and finally it could be a dermoid.

The general opinion was that it was not malignant. Some inclined to the inflammatory theory, but the majority held that it was a degenerating dermoid.

April 25, 1922. The growth is now decidedly larger and begins to encroach upon the pupil area. It is more yellow, and the line of injection is invading the tumor instead of being confined to its edge. The eye itself is showing a general ciliary blush.

The patient was now admitted to Hospital and tested by injections of old tuberculine. Three injections were given at intervals of a week as follows: 0.001mg 0.002mg 0.004mg. There was no reaction of any sort. A short course of injections of T.R. had no influence upon the progress of the case.

The Wassermann was negative.

I took a thin shaving from the surface of the tumor with a Beer's knife. This was examined by Mr. Eric Assinder, Pathologist to the Hospital and he reported that it consisted of normal corneal tissue, but that the section was too thin for an accurate examination.

The tumor remained angry looking and showed no sign of yielding to treatment so I eventually persuaded the Radium Institute to irradiate the growth. This was done, but there was no obvious result, in fact for some time the eye was very irritable and injected.

In August the injection was less and at the end of 1922 the eye was free from all inflammation.

At the present time, May, 1923, the eye is perfectly white. The tumor has become flat and is yellowish white. It does not invade the pupil area, and the vision is still $\frac{1}{4}$ ths.

The diagnosis is still open to doubt, but it seems obvious that malignancy can be definitely excluded. The most probable explanation is that there was at the limbus a small dermoid cyst that had not been noticed. This commenced to enlarge and then to degenerate with inflammatory reaction.

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Text-Plate XXXIII.

ILLUSTRATING DR. T. HARRISON BUTLER'S ARTICLE ON "A DERMOID
OF THE CORNEA."



REPORT OF A CASE OF PURPURA HEMORRHAGICA.¹

BY DR. MARTIN COHEN, NEW YORK CITY.

(With three illustrations on Text-Plate XXXIV.)

PURPURA hemorrhagica, first described by Werlhof in 1775, and also termed morbus maculosus Werlhofii though usually defined as a severe form of purpura, is in reality a definite clinical entity and should be designated as a primary idiopathic disease of the blood. In addition to the purple patches upon the skin and mucous membranes, due to subcutaneous extravasation of blood, which are characteristic of the more common form of purpura, this affection is attended by severe hemorrhages from the mucous membranes and many grave constitutional symptoms, the blood changes being especially marked.

There have been frequent reports of conjunctival and retinal hemorrhages occurring in the course of purpura hemorrhagica but I have been able to find only three such reports which contain microscopical eye findings, and even these are without the comparison or corroboration of hematological study. The first of these cases is that reported by Ruc in 1870; the second that of Pagenstecher, published in 1905; and the third, that observed by Marx the following year (1906). It seems, therefore, that a report of the following case will be of interest, especially in regard to the microscopical eye findings and the results of hematologic study:

J. S., male, married, born in the United States, aged 42, was admitted to Dr. Bullowa's service at the Harlem Hospital, November 18, 1921, because of subcutaneous

¹ Read before the Section on Ophthalmology, N.Y. Academy of Medicine, February 19, 1923.

hemorrhages over the surface of the body, extravasation from the gums, and general debility. The family history was irrelevant; the wife was in good health and had had no miscarriages; there were no children. No history of diseases of childhood was given, but the patient had had yellow fever in 1898. There had been excessive use of alcohol up to within six months of the time of admission.

The illness for which treatment was sought had begun three months before, ushered in by general weakness and lassitude. About two months before, blood had begun to ooze from the gums, and this had continued up to the time of admission, although the gums were never tender nor painful.

On inspection, the patient appeared much exsanguinated and asthenic; he was emaciated and very drowsy. Blood was oozing from the gums, the tongue was dry and coated with blood clots, and the breath of very foul odor. The teeth were in poor condition, pressure upon the gums causing pus to exude from the alveolar pockets, which on culture showed streptococcus viridans. Epistaxis was also observed.

The heart was not hypertrophied; the action was regular; there were no murmurs and the heart sounds were clear and distinct. The pulse, though thready and almost impalpable, was rapid and regular. The reflexes were normal; there were no glandular enlargements; and the lungs, abdomen, and rectum were negative. The Wassermann reaction was negative; no pus, blood, nor evidence of arsenic could be demonstrated in the urine, and the stools were negative. Blood pressure: systolic, 130; diastolic 80. Temperature, 99. There was no clinical evidence of arteriosclerosis.

The skin of the entire body showed hemorrhagic spots of various sizes scattered over the arms, chest, abdomen, flanks, thighs and legs, in many places becoming confluent. These spots did not disappear on pressure. The patient complained of poor vision in both eyes.

The pupillary reactions were normal; the field was normal for form and colors. The tension, musculature, anterior chamber, and iris were normal. The fundus examination showed symmetrical changes in each fundus, these changes having the appearance characteristic of old and recent hemorrhages. The disk margins were somewhat blurred but not elevated. The retinal vessels showed no alterations except venous hyperemia. An old circular hemorrhage and several recent linear ones were observable in the circumpapillary area, some of them showing the central yellowish dot characteristic of blood changes in general. In the macular area was a pre-retinal hemorrhage which appeared to be older than those previously mentioned.

ILLUSTRATING DR. MARTIN COHEN'S ARTICLE ON "REPORT OF A CASE OF
PURPURA HEMORRHAGICA."

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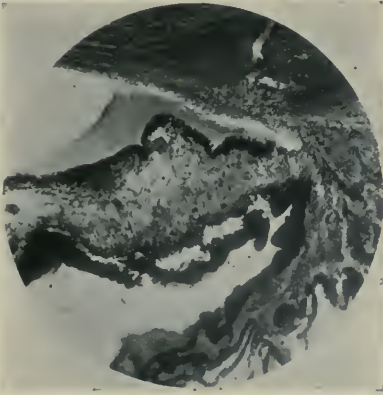


FIG. 1.

Coagulation of red blood corpuscles and fibrin in sinus angle and spaces of fontana.

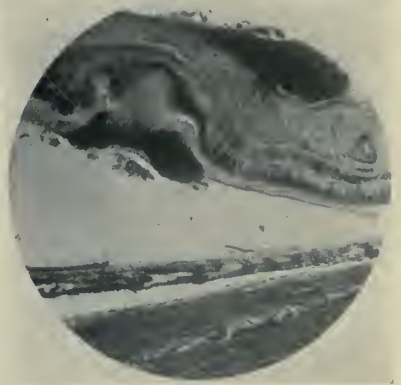


FIG. 2.

Pre-retinal, inter-retinal, and sub-retinal hemorrhage.

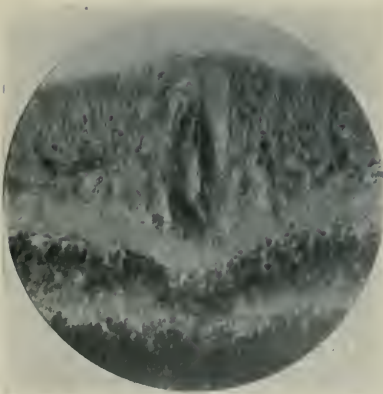


FIG. 3.

Medial thickening of artery.

In the periphery, three large ill-defined foci were scattered in the retina, dull white in color and not surrounded by pigment nor blood. Two of these foci were absorbed later.

Retinal hemorrhages are of the same nature as those taking place in other parts of the body in cases of purpura hemorrhagica, and are believed to be due to a marked diapedesis of red blood cells brought about by the pathological condition of the blood. The blurring of the disk margin and the dull white foci were probably caused by edema, secondary to a venous stasis. The yellowish dots seen in the center of the hemorrhagic areas are explained as collections of leucocytes.

The hematological examination on admission showed:

Red cells,	650,000	Hemoglobin,	15%
White cells,	9,000	Polymorphonuclears,	80%
Platelets,	82,000	Lymphocytes,	20%

Bleeding time, 9 minutes

Coagulation time, 18 minutes

Fragility test of red blood cells, normal. As noted above, the blood platelets were markedly diminished.

The clinical diagnosis was purpura hemorrhagica.

The treatment consisted of intravenous injections of calcium chloride and sodium citrate, and several transfusions of whole blood. Splenectomy and deep X-ray treatment were also suggested, but were not tried.

The patient died from exsanguination on December 23, 1923, thirty-seven days after admission. At autopsy, nothing pathological was observed macroscopically. Unfortunately, no microscopical sections were made for the study of a diffuse vascular disease. An hour after death, one eye was removed and fixed in 10 per cent. formalin. After fixation the eye was embedded in celloidin, and then sectioned and stained with a modified van Gieson. Forty-five sections of the eye were studied, although no serial sections were made.

Microscopical Examination.—The cornea was normal. The anterior chamber showed a coagulation of fibrin and red blood corpuscles located in the sinus angle and also red blood cells in the spaces of Fontana (Fig. 1). The uveal tract and vitreous were normal.

Retina.—A large pre-retinal hemorrhage was seen in the peri-macular area, and near the papilla was a sub-retinal hemorrhage (Fig. 2), also all the layers of the retina were suffused with red blood corpuscles,—indicating hemorrhages oozing mainly from capillaries,—while the larger vessels

were not surrounded with hemorrhages. The smaller vessels showed a moderate medial thickening of their walls, mainly of the arteries (Fig. 3). Some of the vessel walls were permeated with a few red cells. The endothelial lining was apparently normal.

The choroid showed a slight medial thickening of the vessel walls, but was otherwise normal. The papilla was moderately swollen.

The characteristic microscopical eye findings were: First, the hemorrhages; second, the moderate medial thickening of the vascular walls of the smaller arteries and veins. The hemorrhages were due to diapedesis of the red blood corpuscles, probably dependent on an unknown pathological condition of the blood. The medial wall thickening was either part of an early arteriosclerosis; or it was secondary to a changed condition of the blood; or the thickening occurred simultaneously with the retinal hemorrhages, the hemorrhages appearing mainly at areas some distance from the vascular wall thickening.

Most authorities are of the opinion that vascular wall lesions are not a factor in this disease. In this case, however, it would seem that the vascular wall thickening noted in the retina and choroid was part of the general disease, although there was no clinical evidence of an arteriosclerosis. It is not usual to find the retinal and choroidal vessels thickened to such an extent in an individual the age of this patient. Unfortunately, no microscopical examination was made of the vascular structures elsewhere in the body.

In conclusion, I wish to call attention to the necessity of microscopical eye examination in this rare disease, on account of the few reports in the literature, and also of the possibility of increasing our knowledge of the pathological alterations of the vessel walls in this disease by studying the vascular changes in the retina and choroid.

SUBPERIOSTEAL ABSCESS IN THE FLOOR OF THE ORBIT.¹

By DR. ARNOLD KNAPP, NEW YORK.

IT is stated that of the accessory nasal sinus inflammations, maxillary sinusitis is second to the frontal sinusitis in frequency as a cause for orbital infections. Birch-Hirschfeld² says that in suppuration of the maxillary antrum there is a high percentage of blindness; of 89 cases, transitory visual disturbances occurred in 11, blindness in 24, and death in 13, possibly because orbital abscess is particularly frequent after maxillary suppuration. An explanation is found in the communication of the veins of the antrum with the inferior ophthalmic vein. A subperiosteal abscess, or a periostitis secondary to an antral infection, is situated in the lower part of the orbit, with swelling of lids, chemosis, exophthalmos, displacement of the eyeball upward, and restricted motility downward as characteristic symptoms. A fistula sometimes develops at the lower orbital margin. In view of the frequency of maxillary infection, it is strange that a periostitis at the floor of the orbit is not more often observed. I have been on a particular lookout for this localization of an orbital periostitis, because I could never explain why the upper wall of the antrum should from its anatomical position serve so often as an intermediary for a pyogenic process.

The following case was therefore of the greatest interest to me:

B. B., aged 29, was seen on February 27, 1923, stating that after an attack of influenza three weeks ago, the left eye had begun to protrude one week later. There was left ptosis, the eye was pushed forward and up and partly

¹ Case presented before the Ophthalmological Section, New York Academy of Medicine, April 16, 1923.

² *Graefe-Saemisch Handbuch*, II. ed.

immobile. The lids were normal; conjunctiva congested; pupil moderately dilated; optic disk normal. An incision had been made in the lower fornix, which contained a gauze drain. On removing there was no discharge. Along the entire floor of the orbit there was a uniform thickening. The nose was examined by Dr. H. P. Howell, who found some pus in the left middle meatus; the antrum was washed out, and contained pus. A wet dressing was applied. February 28: no fever. Swelling in floor of orbit seemed less, the eye about the same. Vision $\frac{2}{8}$. The antrum was again washed out. March 2: the condition of the orbit was about the same. Point of greatest tenderness was on the floor, just outside of the lacrimal groove. As the condition was not improving, and fearing the development of an orbital abscess, it was decided to operate.

Operation.—Incision along the lower orbital margin; the periosteum was detached from the underlying bone. At about 2cm posterior to the bony margin there was a defect in the bone leading into a cavity partly in the floor and in the adjoining inner wall. Some granulations were removed. There was no free pus. Gauze packing. The cutaneous wound was left open. Opening into the antrum from the nose was enlarged. March 4: packing removed. There was retention of purulent fluid, and a rubber tube was introduced. The discharge from the nose had increased. March 5: considerable purulent discharge through the tube. Irrigating the antrum, or blowing the nose, caused a discharge to appear in the orbital wound. Swelling of the eye was distinctly less. No fever. March 12: the antrum had cleared up. Secretion from the tube lessened, and the tube was left off. Gauze packing introduced. The swelling of the lids and the exophthalmos much less. The inferior rectus still remained weak. March 17: returned home. The wound had been dry for several days. No packing. Nose clean. Exophthalmos was very slight. Motility downward was still restricted. April 15: no external deformity. Slight œdema of lid. Motility normal. Interior normal. Vision normal.

The location of the bone defect found at operation proved that this was an empyema of an ethmoidal cell which perforated both into the orbit and in the antrum. This ethmoidal cell belonged to that group which extend outward in the roof of the antrum. The perforation into the orbit causes thickening of the periosteum at the floor of the orbit, just external to the lacrimal groove.

The case was therefore not primarily an antral infection but that of an ethmoidal cell, a condition which much more easily

explains a periostitis at the orbital floor than an isolated antral suppuration.

The method of operating, consisting in a cutaneous incision along the lower margin of the orbit, with retraction of the periosteum, permits exploration of the bony wall and definite localization of the diseased area.

REPORT OF THE BRITISH MINISTRY OF HEALTH ON THE CAUSES AND PREVENTION OF BLINDNESS.

BY DR. P. G. DOYNE, LONDON.

THIS committee was appointed by the minister of health—Dr. Addison—in September, 1920, “to investigate and report on the causes of blindness including defective vision sufficient to impair economic efficiency and to suggest measures which might be taken to prevent blindness.”

Most of the information was obtained in England and Wales and to a lesser extent in Scotland. The register of the blind for England and Wales, March, 1921, shows 34,894 persons registered as blind. The definition of blindness adopted was “too blind to perform work for which eyesight is essential.”

For the purpose of the investigation the following material was obtained: with regard to infants, figures were supplied by Mr. Bishop Harman and by the Board of Education from the medical officers of the various schools; Mr. Bishop Harman in addition submitted evidence from his examination over the past 17 years of 3300 blind and partially sighted children and also from an analysis of 601 cases of blindness of all ages. Further, examination was made of blind workers in London, Liverpool and Bristol by Mr. P. G. Doyne, Mr. H. R. Bickerton and Dr. A. Fells respectively. Mr. Doyne also examined the blind residents of the North London Home for the blind of whom all but 5 were over 50 years of age. To establish uniformity as far as possible, a uniform scheme was adopted in the examination of the blind workers of London, Bristol and Liverpool. The age of the onset of blindness was as far as possible ascertained in the following age groupings, 0-5, 6-15, 16-50, and over 50. The report points out the extreme

difficulty in some cases, where the blind eyes were old and shrunk or where the eyes had been previously removed, in determining the exact nature of the initial lesion. In a brief summary the report points out that in infancy ophthalmia neonatorum is the prime cause of blindness, various congenital defects coming next in frequency and that important factors were interstitial keratitis, diseases of the posterior parts of the globe and to a lesser extent myopia.

In middle life, accidents assume a high proportion and iritis and iridocyclitis advance relatively. After middle life glaucoma assumes a high position and cataract appears as a cause of blindness (only cases where operation had been unsuccessful were included), the other factors prominent in earlier life showing a proportionate decrease. The report then proceeds to deal with certain causative factors in greater detail.

OPHTHALMIA NEONATORUM.

Statistics show that this disease is a serious factor in the causation of blindness, the individual being blinded from birth and throughout the years of highest economic efficiency. A lessened proportionate incidence in later years is shown and this is due to the death of affected persons and the emergence of other factors. Ophthalmia neonatorum has been made notifiable throughout England and Wales since 1914. It is defined "as a purulent discharge from the eyes of an infant commencing within 21 days from the date of birth." Notification from England and Wales showed roughly that the incidence of the disease was 10 per 1000 births. But statistics from various counties and boroughs varied widely. This was largely due to differences in the details of the notification in different areas. Further the duty of notification was laid upon the certified midwife attending the confinement unless the case had already been notified by a medical practitioner. In certain areas only those cases, notified by the midwife, but which had been verified by the doctor, were considered.

The report points out that the primary object of notification was to ensure early and complete treatment and that this rather than accurate statistical records was the object in view and in consequence the widest possible classification for noti-

fication was desirable. On the whole since 1914 the incidence of the disease does not appear to have diminished, but against this there is the most definite statistical evidence that the percentage of impairment of vision and blindness due to this cause has been greatly reduced.

The report urges early treatment at the outset and after care of cases in whom the active stage of the disease has been overcome as in these cases the final visual result may not be apparent at first. Ophthalmia neonatorum is not necessarily venereal in origin but at least 50 per cent. of the cases are of this nature and these are usually the severe cases. Consequently the prevention of O. N. is part of the wider question of the prevention and treatment of venereal disease. With regard to prevention, there is firstly the prevention and treatment of venereal disease in general; the next line of defence is the treatment of the expectant mother—anti-natal treatment is strongly stressed in the report—; then prophylaxis at birth. This latter is largely in the hands of the midwife and can be influenced by the proper training of midwives and by the imposition of suitable punishments in cases of proved carelessness. The report urges that more instruction should be given to midwives concerning this disease and that they should be made to visit ophthalmic hospitals for the purpose of gaining direct experience of O. N. The report does not consider that Crede's method—"2 per cent. silver nitrate drops instilled within the lids immediately after birth"—should be used as a routine by midwives. The excellence of this method is acknowledged but it was thought that an undue sense of security so produced by its use might militate against the scrupulous cleansing of the eyes which is even more important and also that the "inflammatory reaction" often produced by the method might either cause the midwife to notify the condition as O. N. or on the other hand she might mistake the actual onset of O. N. for the "inflammatory reaction." Crede's method should be reserved for the medical man. The report considers that even at the present time cases of O. N. are often not treated as soon as should be and urge that facilities for consultation with an ophthalmic surgeon should be provided wherever practicable. The report recommends that the ministry of health should take steps to insure that adequate nursing

provision is always available for cases of O. N. which are not admitted to hospital. The report also recommends that the general medical council be urged to insist that every student presenting himself for the medical qualification examination shall be examined in ophthalmology. The report urges the advantages of hospital accommodation for the mother along with the infant who is being treated, so that she may continue to feed her infant and may herself be treated if it is necessary.

SYPHILIS.

From the information supplied it was estimated that syphilis was the direct cause of from 10 to 15 per cent. of the blindness existing in the United Kingdom. Attention is drawn to the fact that it is the innocent that suffer most, as evidenced by the high incidence of interstitial keratitis. Syphilitic blindness is but a part of the whole problem of syphilis and its diminution will be dependent upon the success attending anti-specific measures of treatment and prevention.

CONGENITAL MALFORMATION OF THE EYES.

The report states that between 20 and 30 per cent. of blindness in children is due to congenital malformations. But many of these conditions are amenable to treatment which in successful cases will produce a degree of useful sight. The report notes that there is as yet not sufficient knowledge available as to the ætiology of these conditions by which preventive measures can be adopted. An inherited tendency is often demonstrable and where this is present prevention would appear to lie in eugenic measures with regard to marriage.

SURFACE INFLAMMATIONS OF THE EYES IN CHILDHOOD APART FROM OPHTHALMIA NEONATORUM AND TRACHOMA.

Under this heading are included purulent conjunctivitis due to measles, phlyctenular disease and blepharo-conjunctivitis. These conditions are not very common causes of blindness but disable children for long periods from school and are character-

ized by great chronicity and a great tendency to relapses and also finally to considerable impairment of sight. Poverty and bad hygienic conditions are the real causes of the diseases and the report urges for further powers for the local authorities so that children suffering in this way may be treated in special schools if possible in the country.

TRACHOMA.

This disease is now a very small factor as a cause of blindness. Statistics show a marked decline in the number of entrances to the special trachoma schools. It is now in this country chiefly due to introduction from abroad.

MYOPIA.

This is a cause of a quite considerable amount of blindness and a still further amount of serious impairment of sight. Attention is drawn to school myopia and the special myope classes, instituted by the London county council, are fully approved. The importance of occupation for the myope is stressed as so many of these cases suffer failure of sight, by reason of unsuitable employment, in early middle life. Some very striking statistics are produced with regard to this point. In a series of 480 myopes of over 3 diopters (183 of whom were engaged in habitual close work, 297 of whom were not so engaged); of the 183 habitual close workers 97—53 per cent.—broke down on account of failure of sight, whereas of the 297 who were not engaged in close work 28—9.4 per cent.—broke down from eye failure.

GLAUCOMA.

This disease becomes a serious factor in the production of blindness after middle life. The determining cause of glaucoma is as yet unknown. In consequence it cannot be definitely included among the preventable diseases. The report draws attention to the importance of early diagnosis and treatment. The report draws attention to the danger of persons over middle age attending unqualified persons who will not recog-

nize the condition and will attempt to treat the condition by supplying glasses.

INDUSTRIAL EYE DISEASE AND ACCIDENT.

Industrial disease, apart from miners nystagmus, appears to be a small cause of blindness or impairment of sight. The amount of injury to vision caused by accident is however considerable. Statistics on this point are not fully available and the report recommends that the information possessed by insurance companies might well be pooled so that definite information should be available for government departments. A report from the Scottish Board of Health shows that out of 5515 blind persons of all ages on the Scottish register of the blind there were 426 (7.2 per cent.) whose blindness was due to accidents occurring in occupations.

Lead.—The evidence appears to show that blindness due to lead poisoning is small in amount and decreasing. The stringent measures enforced in industries concerned with lead are therefore apparently successful. Of these measures the most important are: (1) removal of lead dust by exhaust ventilation; (2) the use of leadless and low solubility glazes; (3) introduction of labor saving devices; (4) the periodical medical examination of workers.

Derivatives of Benzene and Carbon Bisulphide.—No case of optic neuritis has been definitely established as due to these causes.

Methyl Alcohol.—There appears to be no authenticated instance of injury to eyesight from this cause in the United Kingdom. The committee however draw attention to the danger which may follow upon its use.

Glassworkers and Metal Workers Cataract.—This form of cataract first appears as a post cortical cataract and later matures to a total cataract. In the early stage it causes little impairment of sight and later can be dealt with operatively. It is chiefly important as a cause of loss of working capacity.

Corneal Ulceration Due to Pitch.—Four certificates of this disablement were returned in 1920. Goggles to give protection is recommended as the surest protection.

Miners Nystagmus. This is the most serious industrial

disease. The committee hold that deficient illumination is the essential factor. In 1920 there were 7028 cases in receipt of compensation of whom 2865 were fresh cases that year.

EYE ACCIDENTS IN FACTORIES AND WORKSHOPS.

Such accidents are at the present time notifiable. The proportion of eye accidents to other accidents averages about 4.5 per cent. On this basis approximately 6000 industrial eye accidents occur per annum. No reliable information is obtainable as to the resultant visual loss as the notification is made at the time of the accident. It is chiefly in the metal and engineering trades that eye accidents are most frequent. Flying pieces of metal, splashes of molten metal and small fragments from lathes and drilling machines are the principal agents of damage. The committee made special inquiry into three branches of industry in which there was a high eye injury incidence.

Aerated Water Manufacture.—Although there are not a large number of persons employed in this industry yet the eye accidents are proportionately great. The last reliable statistics are those of 1903. These show that this trade contributed 10 per cent. of all industrial eye accidents. Since then however there has been a great improvement in the machinery employed and it is hoped that the danger in the filling process is now eliminated.

Textile Industries.—Here the damage is caused by the flying shuttle. The incidence of damage is very small, but the damage itself is usually of great severity. The committee advise that further investigation is desirable in order to improve the guards to the shuttles.

Industries Involving the Use of Chemicals.—Here in spite of the great possibilities for damage to the eyes, the actual figures are most satisfactory. The committee were very favorably impressed with the efforts made to secure protection and treatment of such accidents as occur. Goggles and protective masks were the most successful measures together with screens and metal guards to the pumps. Different types of goggles are needed for different processes. It was sometimes difficult to get the men to wear goggles.

CONSIDERATIONS WITH REGARD TO PREVENTION.

The factory act requires that the certifying surgeon shall give a certificate to every child or young person under the age of 16. There is therefore some initial control, but there is no further control of defects of vision in persons who enter industry over the age of 16. The committee consider the question of accurate vision as most important though admitting that there are many processes in the working of which full standard vision is not necessary. They point out the need for correcting glasses and hold that it is desirable that persons in industry over the age of 16 should be subjected to eye tests. With regard to lighting it has been shown that the accident rate as between artificial and natural lighting is far higher in the former even to the extent of 40 per cent. in some cases. Excess of light may be as harmful as deficiency of light. Except in a few special processes, there are no legal requirements affecting the lighting of factories and workshops. Improvement in mechanical devices is the most effective way of preventing accidents. An extension of the use of screens on lathes and abrasive wheels and of the use of side screens in order to give protection against flying particles is urged. Localized exhaust ventilation is valuable as a protection against both dust and small foreign bodies.

THE WEARING OF PROTECTIVE GOGGLES.

It would appear obvious that considerable increase in safety could be attained by the wholesale wearing of protective goggles. There are however many difficulties in the way. There is the natural prejudice on the part of the men, particularly among the older men who consider the habit effeminate and derogatory as employing lack of skill. There are certain other disadvantages consisting in the curtailment of the visual field, discomfort in wearing, steaming of the glass, etc., which tend to reduce working capacity. The committee considers that in this country insufficient scientific attention has been paid to this construction of such protective goggles. They lay down certain general requirements:

1. All injurious particles should be prevented from reaching the eyes from in front, from either side and from below.

2. The goggles should be light and allow a free play of air so that no condensation of moisture on the transparent medium can occur.

3. They should not impede vision.

4. They should not be liable to become obscured by the impact of particles.

Further the committee recommend that steps should be taken to issue detailed specifications of the most suitable goggles and masks for the differing industrial processes.

The importance of promptitude in securing treatment of an eye accident is strongly emphasized by the committee.

EYE ACCIDENTS IN MINES AND QUARRIES.

Statistics furnished by the Scottish Board of Trade show that out of 427 blind persons whose blindness was directly due to industrial accident there were 103 miners and 26 quarrymen. The accidents are mostly due to flying fragments of mineral or metal. With regard to mines the committee think that the wearing of goggles is impracticable and would consider that improved illumination was the most certain preventative. With regard to quarries the extended use of goggles is advised.

EYE ACCIDENTS IN AGRICULTURE.

Injuries from thorns, branches, etc., and from threshing, dyking and loading corn cause the majority of the accidents. In tending cattle injuries may occur. The industry appears to be too little organized for effective means of control.

EYE ACCIDENTS IN CIVIL LIFE.

A great proportion of these occur before the age of 16. Their prevention in so far as they are preventable appears to be a matter of individual common sense and caution.

SYMPATHETIC OPHTHALMIA.

Blindness due to this cause has largely decreased in later years and is due probably to improved technique in the early

treatment. The committee draws the attention of the general practitioner to the ever present danger of this disaster in all cases of penetrating wounds of the eye.

THE TREATMENT OF EYE DISEASE AND ERRORS OF REFRACTION
BY UNQUALIFIED PERSONS.

The committee is of the opinion that it is not desirable and a danger to the public that a person who is qualified to make glasses prescribed by a medical man should be given any degree or qualification which might convey to the mind of the lay public that such a person was competent to treat eyes and prescribe glasses.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by DRs. A. N. ALLING, New Haven; M. J. SCHOENBERG, New York; T. H. BUTLER, London; P. G. DOYNE, London; and K. WESSELY (*Archiv für Augenheilkunde*), Würzburg.

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(Continued from the July issue.)

XII.—THE LENS.

86. BÖHM, FERD. Extraction of the transparent lens in myopia. *Archiv f. Ophthalmologie*, ciii., 2, 1920.

87. GREEN, A. S. AND GREEN, L. D. Vacuum method of intracapsular cataract extraction. *American Journal of Ophthalmology*, February, 1922.

88. JESS. Problem of the origin of cataract. *Deutsche med. Wochenschr.*, 1921, p. 284.

89. McDANNALD, C. E. Vacuum extraction of cataracts. *American Journal of Ophthalmology*, February, 1922.

90. McREYNOLDS, JOHN O. Professor Barraquer of Barcelona and his method of phacæresis. *Ibid.*, February, 1922.

91. SCHNEIDER, CURT. Cataract operation with total and peripheral iridectomy. *Inaug. Diss.*, Leipsic, 1920.

92. SMITH, H. Mature and immature senile cataract. *American Journal of Ophthalmology*, December, 1921.

93. ZENTMAYER, W. Results of cataract operations performed by Col. Henry Smith at Wills Hospital, Philadelphia, Pa. *Ibid.*, February, 1922.

SMITH (92, **Mature and immature senile cataract**) gives the history of the intracapsular extraction and compares its technic and results with the ordinary operation. ALLING.

ZENTMAYER (93, **Results of operations performed by Col. Smith**) records the results obtained by Col. Smith in operating on 18 cataracts at Wills Hospital. He thinks that the free use

of 1-3,000 bichloride is undesirable and that the section causes unnecessary drag on the anterior parts of the eye. The vitreous loss in 38%, incarceration of iris 38%, secondary glaucoma in one. In most of the cases there was vitreous haze or definite vitreous opacities.

ALLING.

MCREYNOLDS (90, **Professor Barraquer of Barcelona and his method of phakærisis**) records his impressions received from a visit to Barcelona. The operation is not suitable except in patients over 50 years of age and is especially contraindicated in the case of dislocated lens and posterior synechiæ. He suggests that injury to the endothelium on Descemet's membrane might be the cause of complications and that the failure to apply the suction cup accurately to the anterior capsule might result in drawing the vitreous into the anterior chamber.

MCDANNALD (89, **vacuum extraction of cataracts**) has devised an instrument along the lines of the erisiphake of Barraquer but instead of employing a valve for control of the air pressure he has made a hole in the hollow handle over which the finger can be slipped to create suction at the tip. He believes that this method has possibilities when applied to selected cases.

GREEN (87, **Vacuum method of intracapsular cataract extraction**) calls attention to some of the dangers of this new method and has improved the instrument of Barraquer by using a foot valve for control of the suction thus relieving the tension on the hand while extraction is in progress. They regard as unsuitable cases those under 60 years of age, Morgagnian cataract and those in patients with prominent eyes. There is danger of rupturing the capsule by too strong suction and the pull required to rupture the zonular may result in detachment of the retina.

BÖHM (86, **Extraction of the transparent lens in myopia**) reports the results obtained in forty-five eyes operated on in thirty-four patients. Eighty-six per cent. were improved, 13.3% remained unchanged, 0.7% were made worse. The lowest degree of myopia was 16 D. No patient was under 10 years of age, or over 40. Serious general disease and retinal detachment, or practical blindness, of the other eye served as contraindications as long as the patient was able to work. Only one eye was operated on at first, the other not less than

two years after a satisfactory recovery. When possible only one eye was operated on, this one to serve for distant vision while the other was left unchanged for near work. The operation employed was discission and extraction some days later, leaving a round pupil. Secondary discission was needed in about half the cases; it never had to be repeated. Healing took place in from ten to twenty-one days, rarely required longer. Prolapse of iris occurred once, without influence on the result. Loss of vitreous occurred three times, glaucoma once, which was overcome. No iritis or signs of infection. Detachment of the retina did not occur early, but once occurred late.

JESS (88, **Origin of cataract**) attempts to explain the process of cataract as a hydrolytic breaking down of the albumin of the lens by ferments, and says that a knowledge of the exact composition of the proteins in the lens is necessary to further advance in this study.

SCHNEIDER (91, **Cataract operations with total and peripheral iridectomy**) compares these two procedures from the standpoints of the final vision, the degree of the final astigmatism, the frequency of prolapse of the iris, the frequency of loss of vitreous, the frequency of infection, and the frequency with which operation for after cataract is needed. From each of these viewpoints peripheral iridectomy appears to be preferable. The vision depends materially upon the permanent astigmatism, and he finds high degrees of corneal astigmatism more common after total than after peripheral iridectomy. Prolapse of the iris occurred in 3.72% of the cases in which total iridectomy had been performed, in 2.48% of those with peripheral. Loss of vitreous occurred in 5.84% with total, in 1.59% with peripheral iridectomy. Other conditions influence the figures regarding infection, but those given are: 3.01% with total, 1.95% with peripheral iridectomy. The figures concerning after cataract operations are not given; they are said to be difficult to compare, but to favor peripheral iridectomy.

XIII.—GLAUCOMA.

94. BRANDT. Trephining. *Archiv f. Ophthalmologie*, ciii., p. 95.

95. GIFFORD, H. Peripheral iridotomy (Curran) in the treatment of glaucoma. *American Journal of Ophthalmology*, December, 1921.

96. HERTEL and CITRON. The osmotic pressure of the blood in patients with glaucoma. *Arch. f. Ophthalmologie*, civ., p. 149.

97. KOYANAGI. Glaucoma and cataract after wasp sting. *Klin. Monatsbl. f. Augenheilkunde*, lxx., p. 854.

98. SEIDEL. Permeability an essential property of the scleral scar after successful trephining. *Arch. f. Ophthalmologie*, civ., p. 158.

BRANDT (94, **Trephining**) has collated the results of 643 operations on 408 patients at the Heidelberg clinic. Cases of simple glaucoma numbered 146 eyes and 177 trephinings. His classification of results seems a little peculiar. Good results are those in which the vision is at least not materially impaired and the tension remains high; satisfactory those in which the tension became normal but the vision fell to a certain degree, while all the rest are included as bad. The longer the eyes remain under observation, the poorer the results. Of the eyes under observation for a year 78.8% showed good results, 9.2% medium, and 12.1% bad, while 90% of those observed less than three months showed good results. Most of the eyes were trephined only once, sixteen twice, five three times, and one eye five times. Of twenty-two eyes that had been operated on otherwise, sixteen were cured by trephining. Eighteen simple glaucomas were treated with iridectomy, for the most part with bad result. The worse the visual field before trephining, the sooner further contraction took place. The improvement of vision varied. In inflammatory glaucoma the results were worse than in simple, good in 72.5% of forty-one eyes. In many cases trephining was performed only after iridectomy had failed. Twenty-five cases immediately trephined gave 68% good, 8% satisfactory, and 40% bad results, while fifty cases treated with iridectomy gave 48% good, 6% satisfactory, and 40% bad results. To protect from degeneration unirritated eyes blinded by glaucoma 55 trephinings were performed on 49 eyes; good tension was secured in 68%. In irritated eyes of the same class the results were not so good; iridectomy was usually performed with 35% good results. In secondary increase of tension the operation was successful in half of the cases. Buphthalmos in children responded to trephining, as to sclerotomy, in the proportion of 3 cured to 4 not cured. The operation was usually performed under local anæsthesia produced by six drops of a 10% solution of cocaine with adrenalin.

The place of trephining was first upward and outward, then upward and inward, downward and outward, downward and inward. The trephine first pointed toward the midpoint of the eye, then its direction was slightly changed toward the anterior chamber. Splitting of the cornea in making the flap is not necessary. Accidents: perforation of the flap, falling of the trephined disk into the anterior chamber, hemorrhages, rarely loss of vitreous, nonprolapse of the iris. Iridectomy is to be desired as it gives better results than trephining without it. Once there was a rapid loss of vision after trephining. Eight late infections, loss of the eye in five. In simple glaucoma the daily dose of miotics which will keep tension down is determined; if there is warrant for believing that this treatment will be carried out it should be instituted, but if not the eye should be trephined. The operation should be done also if pilocarpine is not permanently of benefit, or if the field contracts. Contraindications are diseases of the lacrimal sac, conjunctivitis, fragile conjunctiva, suppurations of the skin. In inflammatory glaucoma also miotics should be resorted to first; if the increase of tension has not subsided within twenty-four hours an operative intervention is indicated. Iridectomy usually suffices, it is performed more quickly, is less painful, and the escape of the aqueous is more gradual. When the visual field is contracted an operation is less dangerous than expectant treatment. In absolute glaucoma intervention may be to relieve pain and to prevent degeneration. In secondary glaucoma one must weigh carefully whether any and what intervention is necessary. In buphthalmos trephining is no better than sclerotomy.

SEIDEL (98, **Permeability an essential property of the scleral scar**) concludes that the effect of trephining depends on the permeability of the scar, that in glaucomatous eyes the height of the tension and the quantity of aqueous which escapes in the time unit stand in causal relation to each other, and finally that the intraocular tension in chronic glaucoma depends upon an insufficient escape of aqueous.

GIFFORD (95, **Peripheral iridotomy (Curran) in the treatment of glaucoma**) has operated upon thirty eyes by the method advocated by Curran, who uses a knife needle with which he pierces the cornea and then the iris at its periphery thus

making a small hole about 1mm in size. He thinks that hypertension in cases where the anterior chamber is shallow, is due to the fact that the lens by pressing on the posterior surface of the iris interferes with the circulation. The hole in the iris acts in a way to establish the communication between the two chambers. Gifford has found some difficulty in carrying out the technic and had two cases which were not satisfactory but on the whole had favorable results. If the results prove to be permanent he is of the opinion that this operation, or some modification of it, may be destined to supplant to some degree those now in use.

ALLING.

HERTEL and CITRON (96, **Osmotic pressure of the blood in glaucomatous persons**) find the average osmotic pressure of the blood lower in persons suffering with glaucoma than in others. A pressure of over 6000 was found in 63% of healthy people, with glaucoma in only 16. Lower than 5600 was not met with at all with normal eye tension, while it was present in 45% of the glaucoma cases. Such differences of pressure may have an influence on the tension of the eye.

KOYANAGI (97, **Glaucoma and cataract after wasp sting**) was induced by a case of this nature to investigate the injuries produced in the eye by stings of wasps and bees. He finds that the poison induces a purulent conjunctivitis often leading to necrosis. Necrosis appears about the sting wound in the cornea, followed by accumulations of leucocytes. At first there is a contraction of the pupil, but this soon passes off and gives way to a marked dilatation, which is to be ascribed to necrotic changes in the iris, especially of the sphincteric portion, consisting partly of hyaline degeneration, partly of a transformation of the muscle into lumpy masses. In one case the endothelium of the cornea was proliferated, extended to the iris and later formed a strong adhesion of the periphery of the pupillary portion outward. It is thought that the increase of tension in the case of the boy who suffered this injury was not due to the apposition of the strongly contracted iris to the posterior surface of the cornea, but to a proliferation of the endothelium which extended over the anterior surface of the iris and joined the root of the iris to the cornea. Such an increase of tension was not observed in the animals experimented

on, for which Koyanagi suggests the explanation that the aqueous secured new exits through the cornea robbed of its endothelium. The resulting cataract is thought to depend chiefly upon the direct action of the poison which enters from the anterior chamber, yet possibly it depends also on the toxic action on the cornea. The iris is further depigmented through degeneration of the chromatophores and of the pigment in the posterior layer.

XIV—THE VITREOUS, RETINA, AND OPTIC TRACT.

99. EPPENSTEIN. **Primary tuberculosis of the retina.** *Archiv f. Ophthalmologie*, ciii., p. 154.

100. FEJER, J. **The treatment of tumors of the hypophysis.** *American Journal of Ophthalmology*, January, 1922.

101. FINNOFF, W. C. **Some impressions derived from the study of recurrent hemorrhages into the retina and vitreous of young persons.** *Transactions of the American Ophthalmological Society*, 1921.

102. GIFFORD, H. **Late traumatic detachment of the retina. Its prophylaxis and importance from a disability compensation standpoint.** *American Journal of Ophthalmology*, November, 1921.

103. HEINE. **Milk injections in albuminuric retinitis.** *Münch. med. Wochenschrift*, 1921, No. 43.

104. HIRSCH. **Air embolism in the central artery of the retina after washing out the antrum.** *Klin. Monatsbl. f. Augenheilkunde*, November, 1921.

105. HOLLOWAY, T. B. **Snowball vitreous opacities.** *American Journal of Ophthalmology*, February, 1922.

106. SCHMIDT. **Milk injections in albuminuric retinitis.** *Münch. med. Wochenschrift*, 1921, No. 48.

107. WILLIAMSON. **Two cases of thrombosis of the retinal vein, one showing a hole, the other a star at the macula.** *British Journal of Ophthalmology*, February, 1922.

108. YANO, F. **Atypical circinate retinitis.** *American Journal of Ophthalmology*, October, 1921.

HOLLOWAY (105, **Snowball vitreous opacities**) calls attention to certain vitreous opacities which differ decidedly from the cholesterol crystals of synchysis scintillans, a case of this sort has been examined pathologically and described by Verhoeff under the title "asteroid hyalitis." The author has added four cases to those already reported. Instead of appearing as glittering showers they are dead white or lardaceous in appearance showing a tendency to be globular and not flat. The movements in the vitreous are also different. He does not

agree with Verhoeff in ascribing this condition to intraocular angiosclerosis. It is possible that the condition may be due to hypercholesterolemia of suprarenal origin. These bodies should not be confused with the whitish deposits sometimes seen in a detached retina nor with the large round corpuscle-like vitreous opacities found in severe types of uveitis, nor with the margins of exudate.

ALLING.

HIRSCH (104, **Air embolism of the central artery of the retina after washing out the antrum**) describes a case of this nature. The papilla was quite white, the arteries appeared to be interrupted by brilliant white, bloodless bands. The phenomenon disappeared in a few minutes, and subsequent ophthalmoscopic examinations revealed nothing.

HEINE (103, **Milk injections in albuminuric retinitis**) reports that in two cases the vision was greatly improved, in one from $\frac{6}{60}$ and $\frac{6}{80}$ to $\frac{6}{8}$ and $\frac{6}{10}$, in the other from $\frac{6}{60}$ and $\frac{1}{12}$ to $\frac{6}{8}$ and $\frac{6}{10}$. In two the vision remained the same in spite of the retinal disease, and in two others the vision of one eye improved while that of the other failed.

SCHMIDT (106, **Milk injections in albuminuric retinitis**) also reported a case in which an albuminuric retinitis was considerably influenced in this way.

Aside from a scleritic focus and a very few infiltrations of lymphocytes in the choroid and ciliary body, EPPENSTEIN'S (99, **Primary tuberculosis of the retina**) case showed foci of lymphocytes and epithelioid cells in the retina. There were infiltrations in the perivascular lymph spaces of the papillary vessels, especially of the veins. At the blind end of the sheath of the optic nerve were foci with epithelioid and giant cells. In the vitreous was a shrunken mass supplied with newly formed vessels coming from the papilla, which had caused a detachment. The freshest foci lay proximally, so the tuberculosis seemed to threaten to extend to the meninges, and it is recommended that when such an eye is enucleated a large piece of the optic nerve should be resected at the same time.

The pathology of holes at the macula has been a subject of speculation for many years. The condition is usually connected with trauma, and in this connection various theories have been started. Menteith Ogilvie favored the theory of

Tearing by Contre Coup, and Fuchs suggests a mild traumatic retinitis causing a serious exudate, which ruptures the internal limiting membrane. Coats supported the theory of œdema as being the underlying cause, and also stated that holes had been observed in non-traumatic cases. WILLIAMSON (107, **Two cases of thrombosis of the retinal vein, one showing a hole, the other a star at the macula**) brings forward two cases, in both of which there was thrombosis of the retinal vein, with the formation, in one, of a hole at the macula, and in the other of a star at the macula. It is suggested that in this latter case a hole would eventually have appeared. Both eyes were excised.

In each case there was no suggestion of trauma, but in both there were evidences of past irido-cyclitis. Williamson points out, and the micro-photographs, with which the article is illustrated, clearly show, that in each case there is a sub-retinal œdema of the macula region. This sub-retinal œdema, Williamson thinks, is the primary cause of the hole formation, degenerative changes occurring subsequently in the retina.

As to the causation of the sub-retinal œdema, Williamson suggests that in these two cases there is a toxic influence,—shown by the presence of the irido-cyclitis—acting on the retinal veins, causing thrombosis, and acting on the delicate macular choroidal capillaries, causing degeneration of their walls and consequent œdema. This fluid then collects in the potential space between the rods and cones and the pigment epithelium.

FINNOFF (101, **Some impressions derived from the study of recurrent hemorrhages into the retina and vitreous of young persons**) from his observation of five cases and a study of literature concludes that tuberculosis especially of the veins is the common cause although syphilis, focal infection, and hemophilia may play a part. The first changes are at the periphery of the retina and retinitis proliferans follows in most cases. The detachments are due to traction and not to sub-retinal hemorrhages. The disease is much more frequent in men and the prognosis is poor.

ALLING.

GIFFORD (102, **Late traumatic detachment of retina. Its prophylaxis and importance from a disability compensation**

standpoint) states that most detachments, in eyes not predisposed, are traumatic and may occur years after the injury. He relates a case in which the eye was struck by a sling-shot and showed immediately a slight hemorrhage in the anterior chamber and a cloudy vitreous. The only evidence which remained later was a small posterior polar cataract and a few vitreous opacities. Four years afterward however, the patient complained of disturbance in the vision and a detachment in the lower outer quadrant was discovered. He thinks that cases of perforating wounds and contusions should be treated with rest, binocular bandage and salicylates or pilocarpine sweats and should be warned against strain or shock for a number of years following the injury. ALLING.

YANO'S (108, **Atypical circinate retinitis**) patient was a boy of thirteen presenting in each eye an oval zone of white exudation including the macula and extending about the nerve on the nasal side. Vision was lost in the right and one tenth in the left. No cause for the disease could be found. It is interesting because of the age of the patient and its extension to the nasal side of the papilla. ALLING.

FEJER (100, **The treatment of tumors of the hypophysis**) reports two cases of pituitary tumor which were treated with X-ray appropriately arranged for necessary penetration. In the first case three treatments were given each lasting about three hours and there was a slight improvement in the vision which had been reduced to about $\frac{5}{10}$. The second case had been totally blind but under similar treatment regained a vision of $\frac{5}{10}$ with enlargement of the fields.

XV.—ACCIDENTS, WOUNDS, FOREIGN BODIES, PARASITES.

109. BELLOWS, G. E. Gunshot wounds of brain with visual field defects. *American Journal of Ophthalmology*, December, 1921.

110. BLECKMANN. Causes of total blindness in war. *Diss. Marburg*, 1920.

111. LI, T. M. Hole in the macular region of both eyes due to simultaneous injury. *American Journal of Ophthalmology*, January, 1922.

112. PILLAT. A case of cysticercus subretinalis. *Wien. klin. Wochenschr.*, xlii., p. 925.

113. VOGT. A case of siderosis bulbi examined with the slit lamp microscope. *Klin. Monatsbl. f. Augenheilkunde*, February, 1921, p. 277.

BLECKMANN (110, **Causes of total blindness in war**) found among 114 blinded during the war that twenty-six had had both eyes shot out, or so badly injured that the remains of the eyes had to be removed by operation. In forty-one one eye had been lost and the other blinded by a direct lesion from in front, or from the side (in 15 cases), or indirectly through a shotwound through the orbit and temple (16 cases). In twenty cases there was practical blindness caused in nine by a direct lesion, in eleven by shotwound of orbit and temple, in one by sympathetic ophthalmia which set in ten and a half months after the injury; after enucleation of the second eye the first recovered with a vision of $\frac{1}{60}$. Eight had been blinded by shot wounds of the occipital region. Three presented homonymous hemianopsia, one bilateral central scotoma, one a paracentral scotoma, three changes in the optic nerve which indicated cranial complications. In one case of blinding by bilateral phthisis bulbi a metastatic ophthalmia was ascribed to a suppurating wound of the thigh. Only ten cases were not traumatic: 1, Cystic tumor in the left temporal lobe with choked disk; 2, bilateral high myopia and detachment of the retina; 3, intraocular cysticercus; 4, bilateral very severe iridocyclitis; 5, central choroiditis; 6, optic atrophy after meningitis; 7, optic atrophy after choked disk; 8, genuine optic atrophy; 9, optic atrophy in multiple sclerosis; 10, iritis and keratitis in Werlhof's disease.

Observations made during the war have increased our knowledge of the visual area in the posterior cortex and there is substantial agreement among the British, French, and German reporters. It seems well established that the upper and lower borders of the calcarine fissure correspond to the upper and lower halves of the retina of the same side; that the macula is represented in the extreme tip of the area perhaps extending a little onto the lateral surface; that the cortex from before backwards, represents the retina from the periphery inwards to the macula. BELLOWS (109, **Gunshot wounds of the brain with visual field defects**) cites three cases which illustrate some of these points. The reason why the macula is so frequently spared in hemianopsia is explained by the fact that the cortical area is supplied both by the posterior and middle cerebral arteries so that the occlusion of one alone would still leave the

region unaffected. Defects in the lower fields are much more common because the lower visual cortex is in close proximity to the cerebellum and the great sinuses and wounds in this region are much more likely to be fatal. He thinks that the left field, if there is any difference, is likely to be smaller than the right but offers no explanation.

ALLING.

I.—THE EYE IN ITS RELATIONS TO GENERAL DISEASE.

1. ARLT. Encephalitis lethargica ambulatoria. *Klin. Monatsbl. f. Augenheilkunde*, 1921, p. 928.
2. BALL, J. M. Errors in ophthalmic literature. *American Journal of Ophthalmology*, May, 1922.
3. BELL, G. H. Retinitis proliferans from anæmia produced by Hodgkins' disease. *Ibid.*, July, 1922.
4. BREGAZZI. Epidemic encephalitis. *Deutsche Zeitschr. f. Nervenheilk.*, LXXII, p. 15.
5. BRAM, I. Exophthalmos in exophthalmic goiter. *American Journal of Ophthalmology*, August, 1922.
6. CALHOUN, F. P. Ocular manifestations in a case of hypophysial syphilis. *Ibid.*, December, 1922.
7. COLLIN. A rarely cured tumor of the brain. *Klin. Monatsbl. f. Augenheilkunde*, 1921, p. 121.
8. FLECK. Isolated reflex immobility of the pupils in a healthy adult as an indication of congenital syphilis. *Zeitschr. f. die gesamte Neurologie u. Psychiatrie*, 1921, p. 34.
9. GUTMANN. Connection between diseases of the eye and of the teeth. *Deutsche med. Wochenschrift*, 1921, p. 565.
10. HORNIKER. Ophthalmoscopic studies in war nephritis. *Arch. f. Ophthalm.*, Fuchs' Festschrift, p. 104.
11. KEY, B. W. Hypophysial disease probably of syphilitic origin. *American Journal of Ophthalmology*, December, 1922.
12. KRAEMER. Keratomalacia in erythrodermia desquamativa. *Wien. med. Wochenschrift*, 1921, p. 1063.
13. LENZ. Pathological anatomy of encephalitis lethargica. *Klin. Monatsbl. f. Augenheilkunde*, 1921, p. 929.
14. LIBBY, G. F. Epidemic encephalitis from the standpoint of the ophthalmologist. *American Journal of Ophthalmology*, October, 1922.
15. MASON, V. R. Optic Neuritis in Serum Sickness. *Journ. A. M. A.*, Jan., 1922.
16. MCGUIRE, H. H. Observations in a case of lipæmia retinalis. *Ibid.*, November, 1922.
17. PATON, LESLIE. Tabes and optic atrophy. *British Journal of Ophthalmology*, July, 1922.

18. PERLIA. Acute retrobulbar neuritis after inhalation of benzol fumes. *Klin. Monatsbl. f. Augenheilkunde*, 1921, p. 109.
19. PROCKSCH. Bilateral keratitis and iridocyclitis in erythema multiforme exudativum. *Wien. med. Wochenschrift*, 1921, p. 1076.
20. SATTLER. A case of retrobulbar optic neuritis as an early symptom of Graves' disease. *Wien. med. Wochenschrift*, 1921, p. 1084.
21. SIDLER-HUGUENIN. Choked disk in tetany. *Arch. f. Ophthalm.*, cvii, p. 1.
22. WAETZOLD. Eye disturbances from optochin and their prevention. *Therapie der Gegenwart*, lxii, p. 96.
23. WOLF. Eye disease in xeroderma pigmentosum. *Arch. f. Augenheilk.*, 1921, p. 168.

ARLT (1, *Encephalitis lethargica ambulatoria*) observed a case of this nature which was marked by a left hemianopsia that passed away completely after a few weeks.

LENZ (13, *Pathological anatomy of encephalitis lethargica*) found no changes in the cerebrum and only slight ones in the ganglia. In the caudex cerebri, on the contrary, he found infiltration of the sheaths of the vessels, multiplication of cells and neuronophagia, especially in the region of the oculomotor nucleus. No hemorrhages were found. His findings incline him to think that the brain disease comes by way of the lymphatics rather than by way of the blood.

BREGAZZI (4, *Epidemic encephalitis*) discusses the manifold symptoms of this disease and points out that none of them are of themselves diagnostic, while the entire picture formed by them becomes so. Lumbar pressure is usually increased in acute cases. Some of the cases which came under his observation had supranuclear disturbances, some involvement of the spinal cord. Anomalies of the tendon reflexes were frequent. In one case he noted in addition to pareses of the extrinsic muscles a bilateral central scotoma which passed away in the course of three months.

LIBBY (14, *Epidemic encephalitis from the standpoint of the ophthalmologist*), after rehearsing the symptoms of this disease, records the history of five cases which showed muscular paralysis and optic neuritis. He regards encephalitis as a disease of great importance and believes that eye symptoms are present in practically every case. He thinks it is possible to diagnose encephalitis by eye symptoms alone if syphilis is excluded.

Among the corrections which BALL (2, **Errors in ophthalmic literature**) has made are the following: Wallace an American, not Brücke, first describes the ciliary muscle. The sebaceous glands of the lid should be called after Zeis. Argyll Robertson should be written without the hyphen. The so-called Saemisch's incision was described and practised by Guthrie. Iridotaxis was first employed by Guthrie not Critchett. Sclero-corneal trephining was first done by Argyll Robertson. The cautery in corneal ulcer should be attributed to Gayet. The honor of first using suction for cataract extraction should be given to Hulen, and hyperopia is less correct and expressive than hypermetropia.

The variability of the visual fields in tabes and the disproportion existing between the loss of visual acuity and the loss of visual field in the disease is noteworthy. In this paper PATON (17, **Tabes and optic atrophy**) attempts to find an explanation on the pathological side. As syphilis can attack the central nervous system in so many ways it is always difficult to decide as to which of the pathological manifestations are essentially those of tabes. The main question, which becomes apparent, is whether the change is a parenchymatous or interstitial one. As regards the site of the lesion the posterior columns, the posterior root ganglia and the posterior roots all have their advocates. Later work seems to support the theory that the radicular nerve of Nageotte—that portion of the root which is nearest the ganglion and where the dura and arachnoid sheaths have joined into one, but where there is still a definite subarachnoid space—is where the lesion is primarily situated. Regarding the cranial nerves, other than the optic nerve, the oculomotor nerves are most frequently attacked. The site of the lesion here has been held to be in the nuclei. This, if the case is not what might be expected as by comparison with the cord it is the afferent nerve which is the more vulnerable and the anterior root shows a greater resistance to the disease. The idea, suggested by Sherrington, is mentioned namely that the fleeting diplopias of early tabes may be due to disturbances in the afferent proprioceptive impulses from the oculomotor muscles and the muscles of the head and neck. Later authors favor the point where the nerve passes through the dura as the primary point of invasion.

Regarding optic atrophy, the older writers held that the primary seat of the disease was in the ganglion cells of the retina. Much evidence can be produced against this theory, however, for example, it has been shown that there are no changes to be found in the retina unless there are coincident changes in the optic nerve, and that after complete optic atrophy normal ganglion cells can still be found in the retina. Stargard's conclusion is that the simple optic atrophy of tabes and general paralysis is the result of a chronic inflammation commencing in the neighborhood of the chiasma. Richter finds the changes in the optic nerve in tabes and tabo-parésis identical; the granulation tissue no longer playing the predominant rôle as in other tabetic processes. It is an exudative process in which cells of hæmatogenous origin are predominant and in this respect it is more allied to that found in general paralysis. Mott speaks of the greater tendency of cases with early optic atrophy to pass into general paralysis but Richter thinks that the different reaction of the optic nerve can be explained by reason of its purely ectodermal origin, the supporting tissue of the optic nerve being glial in origin whereas in other nerves it is mesodermal. It can now definitely be said that the origin of the disease is due to the actual presence of spirochætes and the old hypothesis of a meta-luetic toxin can be abandoned. It is still an unsettled question as to whether the locally produced toxin acts by producing a parenchymatous degeneration or by acting on the connective tissue causes a consequent nerve degeneration. Paton favors the view that both these factors are at work. With regard to the clinical features, Paton points out that the loss of dark adaptation is one of the very earliest signs of tabes; he also notes the occasional development of colored vision. Regarding the visual fields, two main types may be found: (1) early loss of visual acuity with peripheral contraction of the fields; (2) areas of profound loss side by side with areas of full acuity. Paton suggests that the first type of field is produced when it is chiefly the parenchyma which is involved and the second type occurs when the lesion is chiefly of the interstitial tissue.

COLLIN (7, **A rarely cured tumor of the brain**) reports the successful removal of an endothelioma of the dura weighing 150 grams from the convexity of the right occipital lobe. The

patient had presented brain symptoms for at least four years, but the presence of exophthalmos prevented the diagnosis being made for a long time. Later such symptoms developed as a left homonymous hemianopsia, bilateral choked disk, staggering with a tendency to fall to the right, and from these, together with an exophthalmos of the right eye, the diagnosis was made. Although some of the patient's troubles persisted after the operation, the exophthalmos hemianopsia and choked disk disappeared.

CALHOUN (6, **Ocular manifestations in a case of hypophysial syphilis**) reports the case of a young woman twenty-four years old, who gave evidence of hypophysial disturbance through increased weight, polyuria polydipsia, bitemporal headaches, and scanty menstruation. She presented double choked disk, concentric contraction of the field of vision, and a central scotoma for colors, together with a history of a mild attack of iritis. A decompression operation failed to improve the symptoms, but examination of the ventricular fluid gave a Wassermann of plus 4 although the blood had been negative. Intensive antisymphilitic treatment was followed by complete recovery.

KEY'S (11, **Hypophysial disease probably of syphilitic origin**) patient was a young man aged 19 who complained of diplopia, loss of vision in one eye, headache and nausea. On examination a paresis of the left external rectus and choked disks were found. The field of vision in one eye had 10° concentric contraction and the blind spots were enlarged. Wassermann tests were negative and X-ray examination showed no abnormality of the brain. Later X-ray examinations, however, revealed an enlargement of the sella with some erosion and diagnosis of tumor of hypophysis was made. The patient soon began to develop signs of acromegaly. The choked disks subsided under intensive antisymphilitic treatment but the erosion of the sella seemed to progress. The question was as to whether there was syphilitic lesion, congenital or acquired, of the pituitary or a non-specific tumor or cyst. The choked disk, X-ray findings, negative evidence of syphilis would indicate the latter while a retino-choroiditis, external rectus paralysis, lethargy and tolerance of Hg. would point toward a specific cause.

FLECK (8, **Isolated reflex immobility of the pupils in a healthy adult as an indication of congenital syphilis**) reports a case of this nature. The mother was syphilitic. The patient had never an eruption on the skin as a child; encephalitis and acquired syphilis were excluded. His blood gave a negative Wassermann, but a positive Stern reaction, his cerebrospinal fluid a positive Wassermann. The last disappeared after a year of specific treatment. The immobility of the pupils is regarded by the writer as a cicatricial symptom.

BELL (3, **Retinitis proliferans from anæmia produced by Hodgkins' disease**) shows drawings of a marked and typical case of retinitis proliferans which appeared in an anæmic young man who was suffering from swelling of the glands of the neck and axilla and bronzing of the skin. The patient had diseased tonsils which were enucleated. Bell thinks that attention to diet and focal infections might clear up the ætiology of more of these obscure cases.

In GUTMANN'S (9, **Connection between diseases of the eye and of the teeth**) first case a sharply defined swelling of the lower transition fold appeared five months after resection of the apex of the root of an incisor. The cause was a gangrenous process in the alveolar septum and root of another incisor, and the conjunctival œdema subsided after this had been treated. A similar œdema had formerly existed on the other side during the treatment of a maxillary empyema, caused by periodontitis, until all signs of trouble in the antrum had cleared up. To explain these symptoms he recalls the connections existing between the veins of the alveolar region and the antrum with the facial and ophthalmic veins. The second case had a fistulous opening near the left inner canthus which did not connect with the lacrimal sac. After extraction of the two incisors on the same side there was a free escape of pus, while pressure on the mucous membrane caused an escape of pus both here and from the fistula. In a third case a periostitis of the lower margin of the orbit was ascribed to a gangrenous process in the root of a tooth with a gold crown. In his last case an obstinate eczematous conjunctivitis recovered quickly after the extraction of carious roots from the upper jaw.

During 1916-17, HORNIKER (10, **Ophthalmoscopic studies in war nephritis**) examined 608 soldiers, suffering from renal

disease, with the ophthalmoscope. The commonest symptom he observed on and about the optic nerve was œdema, diagnosed chiefly through the presence of pathological retinal reflexes and the behavior of the small vessels. He found hemorrhages in the retina in 11.5% of the cases, mainly in those having high blood pressure, as in retinitis albuminurica, which constituted 13% of the cases that came under observation. In some cases the retinitis was associated with choroiditic changes, and in one pigment striæ simultaneously with hemorrhages appeared very early, which rendered the explanation of the striæ as due to hæmatogenous pigmentation very improbable. The changes observed in the vessels varied; in some cases the vessels were normal; they were small in most cases of chronic diffuse glomerulonephritis, in all cases of malignant sclerosis, and in one case of uræmic eclampsia; very often, especially in acute diffuse glomerulonephritis, the little vessels about the macula were very tortuous. Although not present in all cases, an ischæmia of the retinal vessels can be seen, so that the writer believes that in all forms of nephritis the retinal vessels have to go through a spastic stage which can be recognized only occasionally because it passes away so quickly. Quite similar symptoms to those of nephritis may appear in other ischæmic diseases, but as ischæmia is accustomed to cause serious functional disturbances, which are not common in nephritis, Horniker thinks there must be a toxic agent which affects particularly the region involved in the ischæmia.

In MCGUIRE'S (16, **Observations in a case of lipæmia retinalis**) case the blood in the retinal vessels appeared to be a light salmon color while the choroidal vessels were filled with normal colored blood. The vessels were not enlarged or tortuous. The blood fat estimation was 8.6%. He has found no case not associated with diabetes. He is of the opinion that more cases would be discovered if the internist were to make use of the ophthalmoscope as a routine.

BRAM (5, **Exophthalmos in exophthalmic goiter**) notes that exophthalmos or goiter are not essential in diagnosis of the disease. Exophthalmos rarely precedes but usually follows the other characteristic manifestations. It is probably the basis on which the other ocular signs depend. A goiter and

exophthalmos are not likely to occur separately. It is unusual for one eye affected to be alone. In the process of recovery the protrusion of the eyeball is usually the last sign to disappear.

SATTLER'S (20, **Retrobulbar neuritis an early symptom of Graves' disease**) patient developed a retrobulbar neuritis for which no explanation could be obtained from a general examination. He was advised not to use tobacco and given iodide of potash, but under this treatment the vision continued to deteriorate and the patient became emaciated. More than a year after the discovery of the central scotoma an exophthalmos appeared and directed attention to other symptoms of Graves' disease, tachycardia, Graefe's symptom, and a slight tremor of the fingers. The occurrence of retrobulbar neuritis in this disease is very rare, but in this case it appeared to be an early symptom.

KRAEMER (12, **Keratomalacia in erythrodermia desquamativa**) saw in an infant which had been suffering from erythrodermia desquamativa for thirteen weeks, croupous conjunctivitis and finally xerosis of the conjunctiva and keratomalacia. Neither cornea became perforated, and recovery took place leaving keratectasia in the left eye, but only a circumscribed macula in the right. Little is known of the fundamental disease, but it appears to be a disease of nutrition. The infant was the third child of healthy parents, nursed, and was continuously in good surroundings.

PROCKSCH (19, **Bilateral keratitis and iridocyclitis in erythema multiforme exudativum**) describes a case of this nature. Although the symptoms in the acute stage were fairly severe, there was a good recovery with full vision. It was thought that the keratitis was metastatic and not caused by the conjunctivitis which was present; the iritis resembled that met with in other infectious diseases with exanthemata.

WOLF (23, **Eye disease in xeroderma pigmentosum**) observed an involvement of the eye in a case of xeroderma pigmentosum in a girl 6 years old whose parents were nearly related. Numerous yellow brown spots covered all exposed parts of the body, but were most marked on the head. On the left cheek was a tumor as large as a cherry. In places the skin was atrophic and showed teleangiectasiæ, scales, and warts.

There was a slight ectropion of the lower lids with vascularization of their margins. The left eye presented a pannus-like condition, diffuse opacity and deposit of numerous roundish spots, together with an irregular mass of pigmented tissue as large as a bean upon the conjunctiva and cornea. The right eye presented a tumor of the cornea with an uneven surface and a wall-like definition, which left only a small part of the cornea clear. The tumor was removed and appeared microscopically to be probably a carcinoma. Wolf thinks that possibly the disease on the eye was analogous to that of the skin, and that the pannus and the other changes were the remains of a broken down tumor with subsequent cicatrization.

PERLIA'S (18, **Acute retrobulbar neuritis after inhalation of benzol fumes**) patient spent two hours cleaning an oil pump with benzol. Shortly afterwards he was taken sick with dizziness and vomiting, and after two days he could no longer see. A week after this occurrence there was a minimal reaction to light of each pupil, amaurosis of the left eye, while the vision of the right was reduced to counting fingers at $2\frac{1}{2}$ meters. Nothing definitely pathological could be found with the ophthalmoscope. Vision finally improved to counting fingers at 6 meters with the right eye, at $\frac{3}{4}$ meter with the left. At this time the ophthalmoscope showed temporal atrophy of the right optic nerve, total atrophy of the left. The right visual field was contracted above and on each side, with loss of power to distinguish red and green, the left was only a paracentral trace.

WAETZOLD (22, **Eye disturbances from optochin**) says that a harmful quantity of this drug may be introduced not only by a single large, but also by repeated small doses, which may be retained as a result of functional disturbance of the liver and kidneys. Hypersensitiveness to optochin rarely exists. Adults should receive 0.25 gram not oftener than four times daily. Children much less.

SIDLER-HUGUENIN'S (21, **Choked disk in tetany**) patient was first operated on for goiter at the age of 27. Twelve years later the goiter had grown again and attacks of tetany had set in, and she was operated on again. Some days later there were marked symptoms of tetany and impairment of the pupillary reactions. Three months later a bilateral choked

disk was discovered, with subsequent opacity of the lens and symptoms of iridocyclitis. Then increase of tension called for an iridectomy in each eye. The cataract was removed from the right eye, but the eye had to be enucleated after eight months because of painful phthisis. Finally the patient died. The microscopic examination of the posterior segment of both eyes showed a swelling of the papilla, absence of all signs of inflammation, and normal conditions in the optic nerve. In the tissue of the papilla little hollow spaces existed between the fibers, but these reached only to the lamina cribrosa. It is therefore evident that choked disk may occur not only as a consequence of intracranial pressure, but also by various toxic influences acting upon the vessel walls.

The syndrome that follows the introduction of a foreign protein into the veins has been described as serum sickness. The symptoms are fever, malaise, urticaria, and glandular enlargement, sometimes albuminuria also.

MASON (15, **Optic neuritis in serum sickness**) has observed three patients who showed optic neuritis after injections of antipneumococcus serum. One died, but the others recovered completely. The evidence at hand seems to warrant the assumption that optic neuritis combined with increase in the cellular and globular content of the cerebrospinal fluid may occur as the result of the serum treatment.

(To be continued.)

BOOK REVIEWS.

VII.—**The Operative Treatment of Glaucoma.** By Colonel H. HERBERT, I.M.S. (retired), p. 152, W. Wood & Co., New York, 1923. Price \$3.00 net.

Colonel Herbert was one of the first to realize the inefficiency of iridectomy in certain forms of glaucoma and has worked persistently for twenty years in the endeavor to repeat conditions which had developed unexpectedly after cataract and glaucoma operations. The author draws attention to the decline of trephining on account of the dangers of a conjunctival bleb. A better substitute is in the author's opinion the iris inclusion method. Deliberate iris inclusion has been objected to because of the evil repute earned by accidental iris prolapses. The author believes that more than one type of operation must be accepted in glaucoma. It is taken for granted that progress lies only along the line of subconjunctival drainage, avoiding late infection on one hand, hypotony and failure to relieve tension on the other. As the successful iridectomies in glaucoma showed uveal impaction and as iris prolapse after cataract operations, if subconjunctival, remained free from inflammation, subconjunctival iridencleisis in a wound of moderate size was taken up. If an iridectomy is successful, the cicatrix remains visible; conjunctival oedema is present, sometimes recognizable only by abnormal pitting on pressure and satisfactory relief of tension. A successful iridectomy is therefore an example of subconjunctival drainage. A leaking cicatrix causes diffuse or localized changes in the conjunctiva. When diffuse, it shows as simple oedema. In higher degrees of filtration oedema there is a milky opacity. Localized changes include the formation of clear vesicular spaces.

For practical purposes, chronic glaucomas fall into two groups—No. 1, readily reducible by miotics, No. 2, not reducible by drops. Group 1 is relieved by moderate drainage of linear iris-free filtering scars; there is no firm closure of the filtration angle. In group 2 there are firm adhesions of the surfaces at the filtration angle, and iris inclusion operations appear to promise well. The advantage of preparatory miotic treatment is self-evident.

Deliberate iris inclusion is objected to from a series of misapprehensions; it offers in the writer's judgment the safest as well as the most effectual means of dealing with the more severe and advanced glaucomas. A fully covered prolapse gives certainty of relief, with permanence, safety, and technical ease and with only one danger, early infective complications—including sympathetic ophthalmitis—if due precautions are not taken. To be effective, a partial lining of both surfaces of the wound must be present to prevent healing. Infection is prevented by thorough conjunctival asepsis. The author is convinced that advance in the treatment of severe chronic glaucoma lies in the application of the iris-inclusion method. The vesicular conjunctival patch with its late infective danger should become a thing of the past. If all fistulous cicatrices, clinically iris-free, are in reality iris-containing opposition to iris incarceration should fall. Trial of iris im-paction is surely now imperative.

As for trephining, which the author himself has not practiced, it is rejected on account of the previously mentioned reasons.

The author recommends the two following methods: *Small-flap sclerotomy*, though its field of applicability requires precise definition. A conjunctival flap, 6mm, is made at some distance from a 2mm scleral incision, 2mm from limbus. Lateral incisions in the scleral flap are then made by sawing movements of a blunt-ended, narrow knife, extending in the deeper layers of the cornea. Iridectomy is not done. Finger pressure in the after-treatment is important.

In buphthalmos the author advises a very limited anterior sclerotomy, when the sclera is very thin, and a small-flap sclerotomy in the earlier cases.

Iris inclusion operation is used for severe and advanced

glaucomas. Superficial fibrosis protects against infection and marginal filtration takes place through the stretched iris-loop. The end (transverse strip) of the iris prolapse is cut away, the iris is drawn well into each angle to be nipped there; the scleral wound should not measure more than 5mm, and the anterior chamber should be tapped peripherally. In the end result there is an elongated, opaque, gray swelling, with uveal tissue at each end, without any trace of conjunctival vesiculation. The author objects to Holth's meridional iridotomy for fear of leading to too localized drainage with vesiculation.

The author has given us a very instructive treatise, based on careful analysis of much practical experience. The book is filled with many observations of great value to those interested in glaucoma operations. The views on the behavior of the conjunctival flap after sclerotomy methods are particularly important. The methods advocated are carefully described, with reasons for the various steps and explanations for the resulting favorable action and avoidance of possible failure. A strong case is made for the iris inclusion method, and a general trial of this form of operation will undoubtedly be the result. There can be no doubt of certain unfavorable results following trephining and that progress must lie in the line of correcting these. Colonel Herbert has shown a way along these lines, for further study and investigation.

A. K.

VIII.—**Diseases of the Eye.** By Sir JOHN HERBERT PARSONS. IV edition, 660 pages, 21 plates, and 326 text figures. New York, Macmillan Co., 1923. Price \$4.50 net.

Parsons' excellent text-book now appears in a new (the 4th) edition with a revised text and a number of important additions. These comprise a section on Preventive Ophthalmology, which treats of the causes and prevention of blindness and of the hygiene of vision. A study of the causes of blindness is an illuminating accessory to knowledge of the diseases of the eye. The factors which produce blindness have a different rate of incidence at different ages, thus blindness from ophthalmia neonatorum, syphilis, phlyctenular disease, measles, trachoma, myopia, glaucoma and industrial condi-

tions, by disease or accident, varies in frequency according to age. Under Hygiene the author considers errors of refraction, illumination, reading and writing, and handicrafts.

This is an unusually well-balanced text-book. The scientific part is excellent, and the practical part is just as well presented. The illustrations should be noted, as they are well done, particularly those in color. The book is not bulky and covers the whole ground of ophthalmology, giving the student a solid foundation in the fundamentals. This is the best of the medium-sized text-books. A. K.

IX.—Arboreal Life and the Evolution of the Human Eye.

By E. TREACHER COLLINS, London, with colored frontispiece and 25 illustrations in the text; 108 pages. Lea & Febiger, Philadelphia and New York, 1922. Price \$1.73.

This is an enlargement of the Bowman lecture given in 1922, which is published in its present form at the instigation and with the aid of Dr. W. Campbell Posey.

In the introduction Collins points out the quality of vision required by the different types of mammals. The herbivorous terrestrial mammals require a wide range of vision, well developed smell and hearing, to allow them to detect danger over a wide area and a capacity for seeing in a dim light. For the carnivorous animals, which track their prey, binocular vision is a necessity and the ability to see fairly well in a dim light. For the arboreal mammals acute stereoscopic vision and good color vision is a necessity while their arboreal refuge does away with the necessity of seeing well in a dim light. Man having descended from the trees has by his needs obtained increased precision of his visual organs.

Thus the visual requirements needed for different forms of environment have resulted in different forms of architecture of the visual organs.

Chapter two deals with the field of vision. In animals needing a large monocular field the eye is set well out from the head and in some the outer wall of the orbit may be incomplete. The enclosure of the bony ring of the orbit in primates steadies the movement of the eyes in the interest of binocular vision. A large cornea increases the size of the field of vision and the clearness of peripheral objects, thus in some rodents the cornea

comprises nearly half the surface of the eyeball, while in the primates the cornea reaches its smallest relative size. In the same way, and largely for the same objects, the lens decreases in size; thus in primates the cornea and lens are so constructed as to sacrifice the monocular field in the interest of acute central fixation.

In ungulata the increased lateral diameter of the cornea, the horizontally enlarged pupil, and the extension of the retina forward on the sides are in the interest of the extension of the monocular field. Animals requiring panoramic vision have their eyes set laterally in the head. In the hare the optical axis is eighty-five degrees from the middle line. The movement of the axis towards parallelism is in the interest of binocular vision. It is interesting to note that in the human embryo the optic vesicles, at first opposite to one another, gradually turn, and before birth become parallel. The recession of the snout no longer needed for purposes for which it was originally intended goes hand in hand with the position of the eyes.

Conjugate movements of the eyes are present in the carnivora while monkeys and man have a highly developed spot of central vision and highly developed powers of convergence and accommodation. Together with the increased central vision in arboreal life, which man has retained after coming down from the trees, goes the increased field of fixation; the ability to bring the fovea to bear on objects in a wide circumference has been accomplished by increased mobility of the eyeballs and of the head.

In primitive animals sight and hearing were poorly developed compared to the sense of smell. The least developed eyes are found in nocturnal animals who have only rods in their retinae. The various aspects of rod and cone vision are then described according to environment. Cone vision is most highly developed in the diurnal rapacious birds. Supplementary means have been developed to fit an environment having a low degree of luminosity. Some deep sea fish have evolved their own illuminating apparatus. Some fish and animals have a reflecting membrane, the tapetum lucidum, more or less completely developed. Monkey and man have no such reflecting device. The former because he is safe in his arboreal

abode, while man became a cave dwelling animal and finally discovered fire. In mammals more or less sensitive central areas are met with but only in primates is the fovea well developed. It is also found in some reptiles and in practically all birds. The depth of the fovea may be regarded as the measure of the sharpness of vision. The normal fovea is especially deep in swift fliers and in birds of prey.

Increased capacity for accommodation and for convergence is intimately associated with foveal development and with the adoption of arboreal life. The accommodative power is greatest in man, slightly less in apes and very considerably less in all the lower orders. This is well shown in the development of the ciliary body. The rudimentary ciliary body has only longitudinal muscle fibers. Man's eyes at birth are comparable to those of terrestrial mammals in the natural state who have not adopted arboreal life. His lenses are nearly spherical and his vitreous chambers of comparatively little depth. Vision is adapted for long distances with little capacity for focussing near objects. By expansion of the globe, flattening of the lens, increase of the vitreous in depth, man's eyes gradually reach the condition most suitable for his environment. If vision becomes restricted to short distances then myopia develops as it will also in the lower mammals confined in small compartments.

A rudimentary color sense is present in some dogs but is weak and this is probably true for some of the other mammals. It is probable that the color sense in monkeys is the same as that in man. The perception of small colored objects is essential to the existence of arboreal animals which live mainly on the fruits. For the existence of carnivorous and herbivorous mammals it is by no means essential.

The lecture closes with a chapter on the protective mechanism of the eyeball. The structure of the orbit, retraction of the eyeball by the choanoid muscle, the nictitating membrane, the lacrimal section are taken up in turn. The grasping of food with hands saves the eyes from much of the risk incurred when the food is seized directly with the mouth, therefore various protective mechanisms have disappeared in the higher orders. Collins concludes that the changes in the visual organs of mammals produced by the adoption of arboreal life

increased both the range and accuracy of their powers of observation. Thus the way was opened for the evolution of the mental faculties which enabled man's ancestors on their descent from trees to assume a predominant position in the animal kingdom.

It is difficult to express adequately one's appreciation of this very scholarly piece of work, which should be carefully studied in the original. It is a subject which has evidently occupied the author's attention for many years, and it is written in a style so simple and clear that the professional as well as the lay reader will read it with interest and enjoyment. G. S. D.

X.—War Blindness at St. Dunstan's. By SIR ARNOLD LAWSON, London, 148 pages. Oxford Medical Publications, Henry Frowde and Hodder & Stoughton, London, 1923. Price \$2.50.

St. Dunstan's was started in 1914 and this is a general review of the cases there between that date and May, 1920. Total number of traumatic cases comprise sixty-six officers, and twelve hundred and sixty-eight non-commissioned officers and men. There were four hundred and eighty-nine non-commissioned officers and men blinded from non-traumatic causes. Eighteen months after the Armistice the total number of those blinded was estimated at one thousand eight hundred and thirty-three and disease was responsible for twenty-six per cent. of these.

Part one of this book deals with cases of traumatic blindness. Notable absence of sympathetic disease is commented on. There were no cases observed after the original injury, though a few developed after operative procedures. Shell fragments and bullets are aseptic and wounds made by them healed quickly and without much reaction. Many shrivelling stumps of this nature left in, which caused no trouble. Cases with complications in the accessory sinuses caused endless trouble. Traumatic cases included a great many choroidal ruptures. There were seventy-two cases of through and through bullet wounds of the orbit. In many cases the optic nerve was severed. Through and through wounds caused seventeen per cent. of the blindness from trauma. Notes of many characteristic cases are given.

Fracture of the skull,—in the fracture of the skull causing blindness, in seventeen cases the occipital regions were affected. Various field changes are spoken of. Unfortunately it was impossible to work up this very interesting class of cases completely. Two cases showed the paracentral loss so well described by Lister and Holmes and various French writers, which is very disabling although the central vision may be normal. It is too bad that more exact descriptions of these field changes could not be given. No charts are published. There were twelve cases of skull fracture other than occipital, mostly smashing blows in the frontal region. Blindness was produced in a variety of ways, direct smashing of the eye, injury to orbital contents by fracture of the walls and hemorrhage, thirdly by concussion. There were sixteen cases of concussion blindness which is so well pictured in the various war atlases. One case, however, is of special interest. This man was knocked down by a shell explosion and both eyes destroyed. Except for this he bore no evidence of external or internal injury. Lawson believes this was due to concussion but the complete evidence is lacking. A very large number of interesting miscellaneous injuries are then presented.

Part two deals with non-traumatic blindness and opens with some general reflections. It is not advisable to accept for service anyone whose defective disease is due to old inflammation of the uveal tract. This is also true in the case of one defective eye, especially when the patient is the subject of syphilis, chronic gonorrhea or the rheumatic affections. All cases of retinitis pigmentosa and chorioretinitis should be excluded from service and for this purpose an ophthalmoscopic examination of every candidate should be made, if only for the purpose of saving disability pension to the State. Military life is particularly apt to cause a recrudescence of some existing disease.

Then follows a detailed consideration of the cases of non-traumatic blindness. Lawson takes the reasonable position in regard to disability pensions, that if a man loses his sight in the service it is not for him to prove that service was the cause but for the State to disprove it. The cases cited are such as those we meet in civil life and comprise a large variety of conditions and a considerable portion of the book is given over to them.

Part three contains a chapter on disability pension and one on re-education. Lawson points out the greater difficulty in educating those who have previously had sight than in educating a blind child. Up to forty, theoretically, all should be trainable; between forty and fifty a few; and after fifty only the exceptional person. The degree of re-education in the different groups must depend on the person's intellectuality and on his mental attitude. Those who lost their sight suddenly are more difficult to re-educate than where the vision disappeared slowly. It is much easier to re-educate in an institution where all are suffering from similar difficulties. The importance of physical exercise and sports cannot be overestimated.

The experiments and experiences at St. Dunstan's are most interestingly described by the writer and the book well repays reading.

G. S. D.

XI.—*Glaucome et Hypotonie (Glaucoma and Hypotony).*

By Professor FELIX LAGRANGE, Bordeaux. 432 pages. Bibliothèque d'Ophthalmologie: V. Morax. Published by O. Doin, 8 Place de l'Odéon. Paris, 1922.

This is a study of the operative treatment of glaucoma and of hypotony, based on the following anatomic and physiologic conceptions. The intraocular fluids pass from behind forward and are excreted at the spaces of Fontana; a closure of this excretion angle with a chronic conjunctival thickening of the cellular meshes at the limbus results in the hardening of the eye. A subconjunctival fistulation at the limbus reestablishes the course of the intraocular fluids and normalizes the ocular tension. The nature of glaucoma explains why in most cases a fistulizing method is efficacious, while it only rarely gives no result at all.

The subject is studied under the following headings: (1) hypertension; (2) changes in the light sense and in the color sense; (3) changes in central and peripheric vision; (4) the anatomic changes of the glaucomatous eye and of the optic nerve in particular; (5) diagnosis and prognosis of glaucoma; (6) non-operative and operative treatment.

The glaucomatous eye owes its hypertension to exacerbations of hypersecretion whose cause is situated in the nervous

system and not in the eye. In the field changes, the study of scotomas is of the greatest importance, as they are the first changes. Lagrange thinks that with the ordinary perimeter, if the object be small enough ($\frac{1}{2}$ to $\frac{1}{4}mm$), the same changes can be elicited as with the Bjerrum screen, especially if the light intensity is reduced. The typical Bjerrum and the para-central scotoma not connected with the blind spot are regarded as pathognomonic of glaucoma. Rarely these scotomas continue to grow even after the ocular tension has been satisfactorily reduced by operation. This Lagrange explains by Schnabel's cavernous atrophy, indicating a pathological state of the optic fibers. As for changes in the light and color sense, the study of the macular region is sufficient; the threshold value, the smallest difference, and the minimum of saturation are to be determined. The minimum differential (U) is first affected. The light sense (R) itself is not affected except in advanced glaucoma. Color sense is affected only when the optic nerve becomes atrophic.

The anatomic changes consist in sclerosed vessels in the retina and in the iris (the choroid is always normal), atrophy of the ciliary body, and the generally accepted changes in the iris angle. The iris, pushed forward by the swollen vitreous, obliterates the spaces of Fontana. The swelling of the vitreous is due to the distention of the vitreous trabeculae with an overproduction of aqueous humor. If this is not relieved, union in the filtration angle takes place. The degenerative changes in the optic nerve consist in lacunae, upon which Schnabel insists with reason, in addition to vascular changes at the level of the anterior and long posterior ciliary arteries. The general state of the patient with glaucoma can be divided into nervous, vascular, or both combined. The former are the neuropaths with unduly excitable sympathetic system and liable to trophic disturbances. Cases where the tension abruptly varies are serious, also where the anterior chamber is absent for a long time; in this Lagrange advises the Heine operation (cyclodialysis). Suppression of the accommodation is a disturbing sign, as it indicates compression of the ciliary muscle. The picture of the optic disk is of great significance. A pallor out of proportion to the excavation is ominous; notwithstanding suitable fistulization, degenerative and trophic

changes (lacunæ) occur in the optic nerve. Narrow retinal vessels portend degenerative optic nerve changes.

If the nasal field contraction is very marked and even approaches the fixation point, an iridectomy is dangerous (p. 76) though a satisfactory explanation for this is not known unless it is due to trophic influences. This danger Lagrange avoids by doing a sclerectomy alone. A central annular scotoma is a very serious symptom prognostically. Color sense is usually well preserved. Under general treatment, calcium chlorid 3 g. daily is taken internally for its action on vascular permeability. This with miotics, massage, general hygiene, and correcting glasses constitutes the general treatment.

As to pathogenesis, the theories of Donders, Knies, and Schnabel together explain the cause of glaucoma. The amount of liquid in an eye depends on the function of the gland of the aqueous humor, the pars ciliaris retinæ, a secretory neurosis, then hypoecretion (*soudure de Knies*) and trophic disturbances follow. The last explain the excavation of the optic nerve head, which is shown by the following: The cup is deepest in chronic glaucoma with only moderate tension. The excavation in eyes with normal tension is due to the degeneration of the nerve of arterial origin. In eyes exposed to great pressure the anterior segment and not the optic nerve gives way.

Lagrange's definition of glaucoma is that it is a dystrophic eye with vascular and nervous degenerations, with hypertension from hypersecretion, followed and accompanied by hyposecretion.

Under operations, the extraocular and intraocular operations other than sclerectomy are then taken up. Sympathectomy does not give a lasting result. Iridectomy acts by producing filtration in the scleral wound for a variable length of time from incarceration of the stump of the iris. In acute glaucoma, iridectomy is excellent; its good effect is proportional to the hardness of the eye. In sclerecto-iridectomy, the two excisions—scleral and iris—have opposite indications; sclerectomy is useful in proportion to the softness of the eye; iridectomy, as has been stated, is the reverse. This means that when the eye is hard, iridectomy may suffice, while in lesser degrees more of the sclera must be resected. In chronic glaucoma with

constant hypertension a favorable result is obtained in 40%, while in chronic glaucoma with intermittent hypertension the good results are only 20%. Therefore, in all cases (p. 175) other than acute glaucoma, and especially in chronic glaucoma with intermittent hypertension, a fistulization must be practiced preferably by a sclerecto-iridectomy.

The scar after a sclerectomy is incomplete and permits passage of fluids by one or more very small fistulæ. The scleral resection must be placed near the cornea, in the region of the canal of Schlemm. A scar may be fistulizing even if fistulæ cannot be seen with the naked eye. Lagrange objects to the term scar, as that is just the condition sought to be avoided, and in place of filtering scar, or fistulous scar, he prefers the word fistulization. An experimental study of fistulization in sclerectomy in a dog is reported, followed by a detailed description of the author's operation (p. 208), the scleral resection being made either with curved scissors or punch forceps. The scleral incision need only be 4mm wide. The attempt is made to divide the tendon of the ciliary muscle, thus opening into the choroidal spaces. If the iris angle is closed, the knife cuts the iris. A button-hole or complete iridectomy is made. Modifications and substitute operations are then described, emphasizing the priority and superiority of the author's method. The various forms of scars which result from this operation depend on a variety of factors. A filtering cicatrix results from a combined sclerectomy and iridectomy, free from all uveal entanglements; a cystoid scar, on the other hand, always follows incarceration of the iris. This traction of the iris is dangerous in the author's opinion, and a healing must be obtained without involving the uveal tract in any way. Three well-illustrated varieties of scars result from the author's operation, according to the form of operation and the state of the eye: (1) Thinning of the sclera. This happens when only a part of the thickness of the scleral flap is resected. While this does not give the same filtration as the others, its effect is not negligible. (2) Subconjunctival fistula. Under the transparent conjunctiva an opening in the sclera is visible. Generally this belongs to glaucoma simplex with feeble hypertension. (3) Ampulliform cedematous swelling of the conjunctiva. This is usual, and results when the entire thickness

of sclera is resected in an eye with plus tension. This is the most satisfactory outcome, and Lagrange has never seen any evil results for the eye, which he ascribes because no iris is caught in the wound. The variety of the resulting scar therefore depends on the degree of hypertension. The size of the scleral resection should be inverse to the hardness of the eye. The scleral flap should be resected along the line of the filtration angle, placed entirely in the anterior chamber and invading neither the ciliary body nor the cornea. Lagrange lays stress on making an opening between the suprachoroidal spaces and the anterior chamber. This is accomplished by dividing the ciliary tendon and cutting exactly in front of the root of the iris. Sclerectomy alone is indicated when (1) the glaucoma has intermittent or slight hypertension; (2) iridectomy is dangerous in cases where the field defect approaches the fixation point; (3) patients with pronounced nervous characteristics, where operations on the iris produce reflex visual inhibitions; (4) hemorrhagic glaucoma. If the tension is up enough to fear prolapse of iris, an iridectomy should be added. Sclerectomy with button-hole iridectomy is indicated when a complete iridectomy is dangerous. It preserves an intact pupil, increases action of miotics, and prevents iris prolapse. Sclerectomy with complete iridectomy is the operation most generally practiced, and is the operation of choice in chronic glaucoma with constant hypertension. The statistics of 104 cases are given as reported to the London Congress in 1913. The seven failures were: 1 acute glaucoma, 2 gradual loss of vision (trophic optic nerve trouble), 1 rapid inhibition after sclerecto-iridectomy, 1 hemorrhages in retina, 1 recurring hemorrhages in anterior chamber, 1 failure from sclerectomy being too small. There was no infection, no loss of vitreous, no expulsive hemorrhage, no traumatic cataract.

The author objects to trephining, because a satisfactory scleral resection must not invade the clear cornea nor injure the ciliary body and be covered by a thick layer of conjunctiva.

Anatomically it is important to remember two zones in the sclera forming the anterior wall of the filtration angle,—a scleral and sclero-corneal portion. The first is the zone of filtration. The length of the subconjunctival sclera in relation to the anterior chamber is measured between a line drawn

through the summit of the iris angle and a line indicating the attachment of the conjunctiva. This measures 0.750mm above (superficial) and 0.65mm below (deep). The sclero-corneal zone measures 1mm above and 0.80mm below. Sclerectomy (p. 355) should not be circular but elongated, 2 to 3mm long and a little less than 1mm wide. The operative wound should be 4mm long, and made with a Graefe knife. It should "fouiller" the summit of Fontana's spaces, so as to cut the ciliary tendon. "The operation is good when one does not cut this tendon, it is perfect if it is cut."

The second part is devoted to **Hypotony**. This means a tension less than 16 (Schiötz). It has two principal causes,—(1) a lesion of the ciliary body; (2) a nervous change in the secretion of the aqueous humor. A subject of ophthalmomalacia is fatigued, debilitated, suffering from hyposympathicotonia or vagotonia, the ductless glands are underacting, and the gland of the aqueous humor is deficient. A moderate trauma, especially to the eye, produces hypotonia, probably from a disorder of the ciliary body diminishing the secretion of the aqueous. Hypotony is observed in high myopia and in detachment of the retina. Examination of the tension in cases of high myopia found it to be reduced in one third and in a much greater proportion in detachment. To raise the tension of an eye, it is necessary to close the filtration channels. This can be done by converting the conjunctiva at the limbus and over the filtration angle into dense scar tissue, which prevents the egress of fluids from the anterior chamber. This is accomplished in part by subconjunctival injections of mercury cyanide or strong salt solution, or by resecting the conjunctiva (peritomy) and cauterizing the region of Schlemm's canal by the galvano-cautery. This operation has been done by the author in 30 cases of high myopia and in detachment. After six months a definite increase in tension was obtained.

This lengthy review seemed necessary to bring out the views of this master on many of the problems of glaucoma. While some of these may not be shared by other investigators, they furnish at least a working hypothesis for further study. A great deal of interesting material has been collected by the author to prove his conception of glaucoma and to show that his operation is not only the first but the best operation for

chronic glaucoma. The excellence of this operation is universally admitted, but that it is difficult in many cases cannot be denied.

A. K.

XII.—Lehrbuch der Augenheilkunde. By Professor PAUL RÖMER, Bonn. 4th edition; 500 pages, 306 text illustrations and 32 colored plates. Urban and Schwarzenberg, Berlin and Vienna. 1923.

Römer, in rewriting the 4th edition of his well-known and deservedly popular book, has reduced the text to 500 pages. While reduction in the size of a text-book is generally desirable, the ease of reading the text in this case has suffered, just as the personality of the writer has been lost to a great extent. Treatment, in particular, is much too brief; this important part is barely outlined and is not sufficient for the beginner. The description of the clinical conditions is excellent, and the subject matter is brought up-to-date by the addition of important recent advances in ophthalmology. An essential part of the book are the many illustrations of which there are 306 in the text and 32 colored plates.

A. K.

INTERNATIONAL CONGRESS OF OPHTHALMOLOGY (1925).

NOTICE OF POSTPONEMENT.

The Committee of British Ophthalmologists appointed to organize an International Congress in 1925 finds, with regret, that it is unable to do so in accordance with the conditions under which the British invitation was accepted by the Washington Ophthalmological Congress in 1922. It will be remembered that at Washington it was decided that the next Congress should be strictly international and that German should be one of the official languages. The Committee has since been informed that the Société Française d'Ophtalmologie, the Société d'Ophtalmologie de Paris and the Société Belge d'Ophtalmologie have passed resolutions to the effect that they feel themselves unable to participate in a Congress if Germans are invited. The Committee is of opinion that to proceed with the Congress in these circumstances would tend to perpetuate a schism in the ranks of Ophthalmology and militate permanently against the progress of the Science which all desire to promote. The Committee has, therefore, reluctantly decided to postpone the Congress.

ARCHIVES OF OPHTHALMOLOGY.

AMÆBIC IRITIS OCCURRING IN THE COURSE OF NON-DYSENTERIC AMÆBIASIS.

BY DR. LLOYD MILLS, LOS ANGELES, CALIFORNIA.

A STUDY of the mass of literature which is concerned with the ætiology of iritis gives convincing testimony of the rôle played by laboratory and general medical advance in the elucidation of that group of cases of uncertain or unknown diagnosis which, as "rheumatic iritis" and latterly as "toxæmic iritis," have formed the main diagnostic rubbish heaps of this subject.

The marked association of iritis with chronic arthritis, which appeared as "rheumatic iritis" in the text-books and ætiological tables of hardly a decade ago and which comprised about 25% of all forms of iritis, has been resolved into its dental, tonsillar, nasal, respiratory, genito-urinary, intestinal, and acute general infections components-of-origin. A relatively small percentage of cases now forms the unknown or uncertain residue of this group.

The resolution of the "toxæmic iritis" group has been begun in like manner by the illuminating researches of Rosenau (1), of Irons, Brown, and Nadler (2), and of Irons and Brown (3), who proved both the active and selective part which bacteria play in the production of iritis. This rôle has been verified clinically and bacteriologically in many cases of iritis associated with focal and general infections, including me-

tastatic panophthalmitis, and the streptococcus, staphylococcus, colon bacillus, typhoid bacillus, pneumococcus, influenza bacillus, gonococcus, and meningococcus intracellularis, among others, have been recovered from the eyes in pure and mixed infections.

There is, of course, a true rheumatic iritis, arising in association with acute rheumatic polyarthritis, but such an association is rare, considering the frequency with which inflammations of the serous membranes occur. It probably would be inexact also, to state that toxæmic iritis does not occur, but true cases of the sort must be very rare. Even in such frankly associated systemic and iritic changes as are reported by Wray (4), Hiram Woods (5), Guibert (6), Brawley (7) and others, as due to the toxic products of disordered metabolism, it is altogether in keeping with the known facts to hold that the iridic lesions result from bacterial invasion of the intestinal wall and their implantation in the form of bacterial emboli in the uveal tract, where their symptoms are produced by their presence and by the direct local action of their toxins. Elschnig (8), in fact, insisted long ago that a study of patients of this type "might lead to the recognition of a definite group of diseases of the uveal tract called into existence by infections of bacterial origin arising in the intestinal tract." A modification of this statement to read "bacterial and protozoan origin" would be more fitting in the light of our present knowledge.

The elucidation of the causes of human iritis is usually simple. The co-existence of a frank general malady; positive reactions to the Wassermann, von Pirquet and gonococcal complement fixation tests; symptomatic improvement or cure following specific treatment in lues or tuberculosis, or resulting from the removal of demonstrated foci of infection, or from the mastery of acute or chronic intestinal disturbances, provides the bulk of evidence for our assumptions of origin. Where but a single source of infection is found and its relief coincides with the relief of a previously intractable iritis, or where the successive removal of several sources of infection has had no influence upon an intractable iritis until improvement or cure has followed the eradication of a last source of infection, the conclusions as to origin may be drawn with

reasonable certainty. Multiple infections, such as syphilis, tuberculosis, alveolar abscesses, and gonorrhœa coexist not rarely in the same individual and in such cases the exact factors of origin may never be determined.

Reasoning from the assumption that iritis represents a bacterial or parasitic metastasis from a known or undiscovered source, its recurrence, then, must be ascribed to the persistence of the constitutional or focal basis of the disease or infection.

In spite of the ample facilities for exhaustive investigation now current, there still remain cases of iritis, usually of the chronic, recurring, and "quiet" types, frequently exhibiting the articulo-ocular syndrome, whose origins are obscure and for which the treatment, prolonged and often unsatisfactory, is wholly symptomatic.

Such a case came to me in April, 1921, and its solution, confirmed by the identification of two more recent but similar cases, provides an explanation of the origin of part, at least, of this group of resistant and intractable irites and offers the hope of cure or symptomatic relief to a group of patients whose outlook has been almost hopeless up to the present.

Miss N. M. B. aged 44, a seamstress, came to California from Illinois eleven years ago. She had never been outside of this country and was never in our Southern States. She was an only child and her mother died of cancer and her father of infection following an incised wound. She had never been a strong child, having had scarlatina when six weeks old. Measles when nineteen led to the continuous use of glasses. She has always been constipated and has always suffered more or less from digestive disturbances. She likes raw foods, especially raw fruits and vegetables.

In 1911, after a particularly hard day at the sewing machine facing strong light, the right eye became red and the lids rough and "scratchy." A few days later a physician found the iris adherent to the lens, from which he was unable to separate it, in spite of vigorous and prolonged atropinization. At this time the eye was not especially painful, though it became intensely so later. The first attack was followed by frequent exacerbations over a period of about ten years, the ocular symptoms always accompanying or following "intestinal attacks," whose main features were severe pain and soreness in the epigastrium, persistent constipation, and especially a "sense of a load of bricks in the stomach," the latter symptom being one from which

she was never wholly free at any time. There was an almost constant feeling of exhaustion, of abdominal weight, and an inability to move the bowels save by enemas. At times the feeling of exhaustion "seemed almost to paralyze" her. Pains in both knees, especially the left, and in the right shoulder were so common accompaniments of these attacks as to give rise to the diagnosis of "rheumatic iritis" and led to heavy and prolonged salicylate treatment, without result. There were no swellings of the joints. The sight of the right eye failed with each attack until finally it distinguished merely the difference between light and darkness. During the last three or four years of this condition the pain in and around the eye could be relieved only by an average daily dose of 65 grains of aspirin. At times the use of a large soap enema at the beginning of an attack would abort it. Abdominal cramp and soreness were noted often. Several teeth which showed apical abscesses were extracted in 1920, but without relief. The nasal sinuses, heart, lungs, pelvic viscera, and urine were negative. The blood Wassermann was found negative on several examinations and two von Pirquet tests were also without result.

In April, 1921, the pain and inflammation in the right eye had become uncontrollable. The lids were swollen and red, the globe was violaceous and heavy lashes of dilated vessels had formed about the limbus as in multiple phlyctenular inflammations, but minus the phlyctenules. There was no corneal involvement. The anterior chamber was made shallow by an iris bombé caused by dense gray-brown adhesions between lens and anterior capsule along the whole margin of the pupil. Tension 5mm Hg. by the MacLean tonometer. The iris was highly vascularized, the large vessel-trunks twining through the reticulum of the iris like stout vines through a trellis. The plastic material which had formed the posterior synechiæ had spread itself broadly over the front of the lens which appeared to be cataractous. There was very faint red reflex and uncertain light projection.

Because of the intolerable pain, the intractable type of inflammation, and the evident impossibility of relief to pain or sight by any lesser measure, the eye was enucleated under local anæsthesia on April 27, 1921, at the Methodist Hospital. Our pathological service had not been standardized at that time, no histological study of this invaluable specimen was made, and a really great pathological opportunity was irretrievably and regrettably lost. Macroscopic inspection, aside from full corroboration of the findings noted above, showed a cataract which involved the anterior

half of the lens, as if the plastic material poured over its anterior surface had soaked into the lens to that depth. The vitreous was fluid and the nerve head moderately but obviously cupped from the secondary glaucoma. There was no gross retinal pathology. The convalescence was normal.

On May 24, 1921, the left eye, which had never been inflamed and whose vision was $\frac{5}{8}$ and Jaeger No. 1 with the post-cycloplegic correction of plus 0.25 sphere and the reading addition of plus 0.87 sphere, began to ache and to blur. This eye was not seen until the disturbance had lasted 6 days, by which time ominous, heavy-looking posterior synechiæ had formed, especially nasally, where cluster-like exaggerations rolled over the adjacent lens capsule like lava ridges. A moderate precipitate existed on Descemet's membrane and, with a slightly turbid aqueous, obscured the fundus. Vigorous treatment with moist heat, 2% atropine solution every hour, 10% dionin every 2 hours, and free bowel action by catharsis and enemas led to rupture of the posterior synechiæ over the entire circumference in 11 days. Considerable plastic matter remained on the anterior capsule and gradually disappeared in about three months.

At this time excessive uterine bleeding occurred from no apparent cause. Two internists and a general surgeon could find no cause for the bleeding or for the persistence of the ocular trouble. A pair of normal tonsils were removed on suspicion. A course of free intestinal elimination was next undertaken by the internist, in which daily high enemas, saline catharsis, and restricted diet, together with rest in bed, played the main part. Some feeling of general betterment followed three weeks of this régime but another attack of ocular redness, pain and plastic exudation occurred a few days later and was relieved by the prompt use of atropine and heat. These attacks recurred now every three to five days, with continuous severe pain, relieved only by repeated doses of aspirin, the eye was constantly tender and photophobic, and it was necessary to keep the pupil continuously dilated. The least lapse in this dilatation would result in the formation of synechiæ. A feature of the inflammation was the gathering of dilated anterior conjunctival vessels about the limbus in the form of vascular leashes, as was so marked a sign in the right eye, and a type often noted to a slighter degree in conjunctival inflammations associated with systemic conditions.

Realizing fully that the basic disorder had not been discovered in this case and with the prominence of the intense pallor, general weakness, and the abdominal symptoms as

the essential syndrome for solution, I referred the patient to Dr. John V. Barrow, in the belief that we were dealing with a parasitic disorder of the intestine, probably amœbic.

Dr. Barrow noted "A very sallow-skinned woman of middle age with heavy black circles around her eyes and an appearance of extreme lassitude and weakness." The outstanding features of his examination were: Abdomen slightly full and tympanitic. Tender over whole abdomen but extremely so over entire colon. Blood pressure low, the systolic being 100 and the diastolic 55. Temperature 98; pulse 80; respiration 18. All reflexes exaggerated. A catheterized specimen of urine was clear, acid, 1020 Sp. Grav., negative for sugar, albumen, casts, parasites, or indican. Blood examination: Hgb. 76%; red cells 4,070,000; leucocytes 6,800; polymorphonuclears 63%; mononuclears 32%; transitionals 4% and basophiles 1%. The first examination of the feces showed a light brown, soft, alkaline stool without blood, but containing many inactive CHILOMASTIX and a predominant number of BLASTOCYSTS and cocci. A second stool yielded almost identical findings but the third one revealed large numbers of ENTAMŒBÆ DYSENTERIÆ (HISTOLYTICA).

On June 5, 1922, anti-amœbic treatment was begun at the Los Angeles County Hospital, the ocular pain and inflammation persisting the while, and with no change in the symptomatic ocular treatment. Sixty grains of ipecac in the form of keratin-coated tablets were given by mouth the first night, together with $\frac{1}{3}$ grain (0.022gm) of emetin hydrochloride intramuscularly. The emetin was repeated each night, with a nightly reduction of ten grains in the dose of ipecac. No purge or enema preceded or accompanied this treatment, but morphine gr. $\frac{1}{4}$ or pan-topon gr. $\frac{1}{3}$ were administered about one half an hour before the ipecac, in order to lessen peristalsis. Ice bags were placed on the throat and epigastrium and perfect bodily quiet maintained.

The improvement in well-being, color, initiative, and especially in the ocular condition which resulted from this course of treatments was little short of marvelous. The ocular redness, pain, tenderness, and iritic swelling disappeared entirely and, although atropine was omitted cautiously two weeks later, the eye has since remained wholly free from inflammation. Some unexplained pain has occurred at times. The sense of abdominal weight passed away during the first week of treatment and has never returned. A similar though less severe course was given at home four weeks later and led to the complete disappearance of the amœbæ from the stools. Emetin has been continued

every second day and two five grain tablets of ipecac every second night, but this is being reduced. The object of this persistent and possibly needlessly intensive use of ipecac is in order to maintain a persistent saturation of the body with ipecac in order to greet the amœbæ in case they should reappear in the intestinal current from some point inaccessible to treatment. Lately an intravenous solution of iron has been given for its effect upon the anæmia.

This case has been under careful observation for five months. The iritis is cured and the tendency to relapse, if it exists, is wholly controlled, as was well shown in December, 1922, when a severe attack of influenza was passed through without scathe. To summarize this case: The patient is a woman of middle age, who suffered from intractable, plastic iritis in the right eye for ten years. This led finally to occlusion of the pupil, secondary glaucoma and blindness, the intolerable pain finally forcing an enucleation. An identical iritis started in the remaining eye three weeks after the enucleation of the first. The outstanding general symptoms have been marked constipation, pallor, pains in the joints, and intense weakness and lassitude. The noteworthy physical findings were a well-marked secondary anæmia, decided tenderness over the colon, and the presence of large numbers of ENTAMŒBÆ DYSENTERIÆ in the stools. A simultaneous cure of the iritis, of the abdominal symptoms and signs, and of the general extreme depression resulted from two intensive courses of treatment with ipecac and emetin and coincided with the disappearance of the amœbæ from the stools.

Inasmuch as no change in the treatment was made other than that of the specific anti-amœbic measures, it seems reasonable to assume that this is a case of bilateral iritis arising from non-dysenteric amœbiasis and, I believe, the first case of the sort ever recognized. The importance of this case, as typifying a form of iritis which has hitherto escaped identification, is confirmed by two similar cases referred to me by Dr. Barrow on January 11, 1923, and first seen by him during the previous week. A fourth case was reported by Dr. Barrow in a personal communication, but no ophthalmic findings are available in this case.

The first of these three additional cases bore the following

explanatory letter from her physician, a well known ophthalmologist of Omaha:

Mrs. H. J., an old patient of mine, has had a most discouraging time with her eyes. Her trouble began with an optic neuritis which gave the impression of being specific but nothing could be found to confirm this suspicion, and specific treatment was of no use. Since then she has had repeated attacks of iritis, with more or less trouble with the vitreous. She has had all sorts of things done for her in the attempt to root out all possible foci of infection, and at one time took a long tuberculin cure to cover that possibility. In spite of everything these attacks have recurred and, during them, the thing that has done her the most good has been full doses of sodium salicylate, *i.e.*, 30 grains taken from three to five times a day.

This patient, 34 years of age, was born in Nebraska and had never been out of the United States nor in our Southern States. Her youthful life had been healthy, save that for about 20 years constipation had been so marked that she was forced to rely upon cathartics all the time. From the time of maturity she has "always been tired out."

The first ocular inflammation appeared in February, 1916, and recurred each winter thereafter, the left eye always being the worse. Has had frequent nasal and bronchial colds, which have always been difficult to stop. The attacks varied somewhat in intensity. The teeth were extracted save for the upper central incisors. In 1920 she went to the Mayo Clinic, where nothing was found to account for the trouble. It is worthy of note as to the common ophthalmologic attitude in these cases, that in spite of the patient's solicitation no examination of the stool was made. In 1920 severe post-cervical neuritis was followed by a very painful attack of iritis, after which the left eye was found to have become practically blind. Much plastic matter appeared in the right eye during the recurrence of 1922, although this was not a painful year.

Examination showed the lids of both eyes to be moderately red and thickened. The conjunctiva of both globes was red, thick and suffused, the process being clearly a chronic conjunctivitis. There was no ciliary injection at this examination. The right pupil was slightly larger than the left, irregularly adherent to the lens, especially nasally where the plastic material had poured over upon the lens capsule in the form of a delicate annular tracery of brown. The right pupil had remained round and capable of moderate

but symmetrical dilatation until the last attack which occurred a month before. Now only the temporal half dilates feebly under atropine. In the left eye the entire margin of the pupil is bound to the lens capsule, save for a few tiny defects in the ring. A heavy layer of transparent plastic matter, looking almost like a shellac, covers the entire pupillary area and is prolonged upon the anterior surface of the iris, flattening it down upon the lens and making the anterior chamber deeper than that of the right eye. There appears to be a beginning incipient cataract in this left eye. The red reflex is still obtainable but the layers of old inflammatory product have obscured all detail of the fundus. Vision is limited to the appreciation of light and darkness. Light projection is uncertain. Vision in the right eye is $\frac{6}{60}$ and Jaeger No. 8, incapable of improvement.

The salient features of her general physical condition were a systolic pressure of 85 and a diastolic of 65, a very tender colon, the tenderness being decided over the cæcum and the descending colon. There is a spot of arrested tuberculosis in the right upper lobe anteriorly. Blood: Hgb. 80%, reds 4,120,000, leucocytes 8,600, polynuclears 57%, mononuclears 41%, basophiles 1%, and eosinophiles 1%. The first two stools were brown, formed, alkaline, without blood and contained active CHILOMASTIX and cysts of ENTAMÆBÆ DYSENTERIÆ. The urine was pale, clear, 1010, and acid. No sugar or albumen. Indican increased. On Jan. 4, 1923, emetin was begun. At this time the stool contained large numbers of BLASTOCYSTS and CHILOMASTIX and E. DYSENTERIÆ. Four days later no parasites were found and nine days after the treatment was begun the chronic conjunctivitis, which was the notable feature of her facial appearance, had undergone a decided improvement. This case is still under intensive treatment, made especially urgent because of the dangerous situation to sight in her sole functioning eye.

The third case, Mrs. A. H., aged 50, had never been outside the middle West of our country. She gave the characteristic history of constipation of many years' duration and of "dragging around all the time just as if I am recovering from a severe illness." For the past 30 years there have been attacks of inflammation and pain in the eyes and for the past 10 years the right eye has suffered from a recurring ulceration of the cornea. The eyes are seldom free from redness and more or less photophobia. During the acute attacks the pain and inflammatory reaction have been so great that she has been confined to bed for weeks at a time. There had been no attacks of

iritis during the past three months but the corneal ulceration recurred about a month ago.

At the time of the first examination here the lenses were both flecked with iris pigment and plastic debris, the residue of repeated old attacks of iritis. A strand binding the iris and right lens together temporally was broken by the use of atropine. The irides were somewhat atrophic. The right cornea showed a depressed fascet of white scar tissue about $2 \times 1 \times \frac{1}{2} \text{ mm}$ in area, at the temporal limbus at about axis 180. In its center was a rough zone, occupying about $\frac{1}{4}$ the area of the whole scar and representing the recent active ulceration. There was decided chronic conjunctivitis in each eye, with notably enlarged anterior conjunctival veins of the type seen in the eyes where conjunctivitis arises out of systemic conditions. Vision, with correction, was $\frac{5}{8}-2$ and $\frac{5}{8}-2$ and Jaeger No. 2 and No. 1 respectively.

The blood Wassermann was negative; teeth and tonsils have been removed. Hysterectomy for fibroids 19 years ago. Blood pressure 110-70; tender colon, ascending colon, hepatic and sigmoid flexures being especially so; fine rales in the left apex; Hgb. 78%, reds 4,024,000, leucocytes 9,600, polynuclears 61%, mononuclears 22%, transitionals 11%, eosinophiles 1%. The stools at the first examination were found "loaded" with the typical cysts of the ENTAMOEBA DYSENTERIÆ. Emetin treatment was begun on Jan. 8, 1923, too early to report the results.

The fourth case of this group came under Dr. Barrow's observation in 1908. Severe recurrent iritis led to chronic and almost disabling ocular inflammation and visual disturbance for over 6 years. The patient, Mrs. J. B., was a young woman who suffered from constipation, abdominal tenderness, and marked lassitude. ENTAMOEBA DYSENTERIÆ were found in the stools in 1912, were eliminated by emetin treatment lasting over some months in several courses and with their elimination the ocular and iritic inflammations disappeared and have never recurred to date, though the patient is seen frequently.

A fifth case, Mrs. J. K. of Long Beach, Cal., is now under examination. Repeated, violent attacks of superficial punctate keratitis have led to so extensive scarring of the left cornea that this eye has only $\frac{3}{8}$ vision, incapable of correction. The right eye is being gradually overrun by a chronic recurring ulceration which started at the temporal limbus and which has gradually pushed its way, with each new attack, across the corneal center until the outer $\frac{2}{3}$ of the cornea are occupied by dense scar tissue. The center of the cornea breaks down, the eye becomes exceedingly red and

vision becomes noticeably reduced. The peculiar feature of these attacks is that while the cornea is normally sensitive to the touch, there is no pain in connection with these attacks. The stools, constipated as in the other cases, showed on Jan. 18, 1923, enormous numbers of the flagellate *GIARDIA* and their possible relation to the corneal ulceration is under investigation, with the similar ulceration noted in case three in mind.

We have here the report of four cases of intractable iritis, all giving characteristic histories of non-dysenteric amœbic infection of the intestine, all showing *ENTAMÆBÆ DYSENTERIÆ* in their constipated stools. In every case the fact that there was no dysentery threw the various physicians who had cared for these patients during many years completely off the diagnostic track. Cure resulted in two of these amœbic irides with the use of ipecac preparations by mouth and hypodermically as the sole addendum to their local treatment. Treatment is not yet sufficiently advanced in the other cases to make their value more than suggestive of the pathologic relation which may exist between iritis of the chronic, intractable sort and non-dysenteric amœbiasis. That this relation is a vital one is shown by my first case and confirmed by the fourth case, coming under Dr. Barrow's personal observation.

The study of the parasitic ailments of man is still so fragmentary and so much in its infancy that refinements of observation to special features of parasitic effects upon such limited portions of the body as the eyes had made comparatively little headway. There are but few, even among the relatively small group of physicians who have some knowledge of zoology, who are qualified to recognize and identify the individuals of the varied array of the parasitic protozoa which make man their host and the human intestine their immediate domicile. This parasitism has come about through the accidental inclusion of free-living species and their cysts or, as Kofoed and Swezy put it so interestingly, by the fact of their habituation through evolutionary derivation from the intestinal parasites of the ancestors of the human stock, perhaps even back into the invertebrate groups.

PROBABLY THE GREATEST SINGLE FACTOR WHICH HAS

HINDERED THE EARLIER AND MORE GENERAL RECOGNITION OF THE PATHOGENICITY OF THE HUMAN INTESTINAL PROTOZOAN FAUNA HAS BEEN THAT THE ONE CRITERION OF THEIR CAPACITY FOR HARM HAS BEEN GENERALLY AND WRONGFULLY ASSUMED TO BE THE PRESENCE OF DIARRHŒA. A slight knowledge of the evolutionary history of the flagellates of man such as, for example, CHILOMASTIX, GIARDIA, TRICHOMONAS, and CRAIGIA, makes it apparent that, as the result of an evolutionary development coincident with that of their human host, there has been so excellent an adaptation that these organisms, like bacteria, may and do live in their host without symptoms of infection. When the balance between host and parasite becomes changed however, as a result of digestive faults, of conditions which cause intestinal stasis or of lowered resistance from other intestinal or general infections, whether parasitic or bacterial, then the enormous multiplication of parasites which ensues causes mechanical and probably chemical irritation, to which the final local reaction on the part of the host is expressed as diarrhoea in a considerable proportion of cases. Barrow (10, 25), from whose direct inspiration most of the clinical and much of the laboratory activity now manifest in these problems in California has sprung, has summed the facts of this symptom in recent papers and stresses the remark that "dysentery is not the all-important symptom in any chronic and heavy protozoan infection. It is often an attendant symptom, but by no means the most direct expression of the malady. In fact, partial stasis produces the only successful incubator for protozoan parasites of any type and upon this rests the ability of the otherwise harmless parasites to develop substances of great pathogenic power, of long duration and certain, chronic, telling effect upon the host. Systemic poisoning is manifested by a definite disturbance of metabolism, joints, blood-forming organs, endocrine function, nervous system, psychic imbalance, which, with dysentery, make the sum total of chronic protozoan infection." In Reed's admirable paper, which has been repeatedly drawn upon, he states that the usual form of infection in California being non-dysenteric, its symptoms are so unexpected and variable that this type of infection is usually the last possibility to be

considered. "Almost any variety and degree of neurasthenia, physical depression, constipation, loss of weight, anæmia, digestive trouble, vague aches and pains and indefinite ill health may be associated with amœbiasis and disappear when the amœbæ are eliminated." The logical application of so varied a symptomatology is that IN ALL CASES OF CHRONIC INTRACTABLE IRITIS OF UNCERTAIN OR OBSCURE ORIGIN AND ESPECIALLY IN THOSE PATIENTS WHO SUFFER FROM GASTRO-INTESTINAL DISORDERS, PROTOZOAN, AND PARTICULARLY AMŒBIC, INFECTION, MUST BE CONSIDERED AS A POSSIBLE ORIGIN OF THE OCULAR INFLAMMATION.

Kofoed and Swezy (12) state that, in contrast with the bacillary infections which produce diarrhœa, the protozoan infections are more resistant and pass more readily into the carrier phase, in which the host appears to have normal health, though liable to relapses. The assumption that amœbæ cannot multiply outside of the body and "that the progress of the contagion under normal conditions of sanitation is slow, makes an epidemic of amœbiasis improbable. Its spread by food handlers, by household contacts, and, in favoring circumstances of poor sanitation, by flies and water, will make its progress all the more insidious because it is not catastrophic and because AN UNKNOWN BUT PROBABLY LARGE NUMBER OF INFECTED PERSONS EXHIBIT NO SYMPTOMS OF DISEASE, OR NO SYMPTOMS ASSOCIATED WITH DYSENTERY." It is also a well proven fact that THE ONLY EVIDENCE THAT CURE OF AMŒBIASIS OCCURS IN THE ABSENCE OF SPECIFIC TREATMENT IS BASED UPON THE EXAMINATION OF AN INSUFFICIENT NUMBER OF STOOLS OR UPON THE FINDINGS OF WORKERS WHO ARE INEXPERIENCED IN THE IDENTIFICATION OF PROTOZOAN FORMS.

It is remarkable that the possible relation of this form of intestinal infection to ocular inflammations, particularly to those of low grade, has not attracted more attention, when the extent of the spread of amœbiasis in the human race is considered. Some authorities estimate that as high as 10% of the population of the globe is infected.

Reed reports a high incidence of infection in California, largely because of the relation of California to the trade routes, to immigration from the Orient and Mexico and tour-

ist travel from Asia. He shows further, that WHILE AMŒBIASIS FORMERLY WAS CONSIDERED AS A TROPICAL INFECTION, IT IS KNOWN NOW TO INVADE PRACTICALLY EVERY COUNTRY OF TEMPERATE CLIMATE AS WELL AS THE TROPICS, WITH THE STRIKING CLINICAL DIFFERENCE THAT DYSENTERY IS A FAR MORE PREDOMINANT FEATURE OF THIS FORM OF INFECTION IN THE TROPICS THAN IN HIGHER LATITUDES.

The story of the life-cycle of the amœba is, of course, common knowledge. The infected person who is suffering from active dysentery is discharging vast numbers of free-living amœbæ. In the carrier phase, however, which comes between the acute attacks, and especially under conditions of intestinal stasis, the organism assumes the resistant form and great numbers of this encysted stage of parasites are discharged. These cysts are swallowed by man and pass unchanged into the small intestine, where the cyst wall is dissolved and where it is probable that a single quadri-nucleate amœba is released. This soon subdivides into four new amœbæ which are carried to the colon by the intestinal flow and remain in the colon as their sole point of invasion, almost without exception. Invasion is accomplished, apart from the secondary invasion of lesions of bacterial origin, by the organization of large numbers of amœbæ on the surface of the mucous membrane and through the gradual erosion of this membrane by their physical activity and probably by the secretion of a cytolytic ferment. Dobell (24) states that the amœbæ do not burrow between the epithelial cell walls, but that they frequently invade the tissue through the crypts of Lieberkühn. This erosion may develop into the characteristic amœbic ulceration, which ceases when the amœbæ are removed by specific treatment. In his classical work on Tropical Diseases, Manson (13) describes the mucosa in dysentery as being slightly swollen, red and injected, the surface softened and perhaps eroded and covered with a blood-streaked glairy mucous of the same character as that which appears in the stools. In the severe cases the erosions have climaxed as ulcers and patches of gangrene which involve, mainly, the sigmoid flexure and the descending colon. "These ulcers extend by burrowing deeply along the submucosa, with sloughing of the superjacent membrane and offer admirable opportunity

for secondary infection in their long, suppurating fistulous tunnels," a secondary infection which frequently occurs to supplement or to inhibit the local and general effect of the specific causes of the colitis.

In the non-dysenteric infections amoebæ may remain in the lesions for considerable periods, which explains the intermittence of their appearance in the stools and stresses the necessity for repeated examination in suspicious cases before a negative finding is finally admitted. Six consecutive daily specimens should be examined, including formed as well as fresh liquid stools, and the identification must be made by a competent person.

The appearance of amoebæ in liver, lung and brain abscesses proves their capacity for invading the blood stream from the intestine, their only known portal of entry. There is no convincing evidence as yet, that human protozoa ever multiply in the blood stream as do the trypanosomes, the spirochætæ of relapsing fever, and the plasmodia of malaria. Long bone and joint involvement, enlarged spleens which are resistant to quinine, rebellious skin infections of obscure types, and appendiceal inflammation are other clinical results of amoebiasis which suggest, however, a greater capacity for tissue invasion than is commonly believed. Kofoid and Swezy (9) state, in their admirable article on "Flagellate Infections of the Human Digestive Tract," "It is to be expected from their structure and from our knowledge of their occurrence and distribution in other vertebrates that the principal flagellate parasites of the intestine may have more generalized capabilities of tissue invasion than have been suspected or detected hitherto. When culture methods for these flagellates shall have been perfected and the protozoan contents of the blood stream more fully searched out by mass cultures, we may hope to have more light on the relation of these parasites to those obscure syndromes to which they have thus far been related so indecisively and uncertainly by clinical and biological investigation." As a partial basis for such belief they report the work of Chatton who, in 1919, examined 1093 Geckos in Tunis and found the intestinal flagellate, *TRICHOMASTIX*, in 4 individuals, once in a smear from the lung and three times in blood cultures in 136 inocula-

tions. The organisms grew on blood gelatose and in ascitic fluid with sterile liver. Hinkleman, in 1919, also reported that 5cc of blood from a human case of diarrhoea and intermittent fever, mixed with distilled water and centrifuged, contained motile bodies showing all the features of *TRICHOMONAS* *INTESTINALIS*. He also reports a second case of diarrhoea in which *CERCOMONAS* *HOMINIS* (possibly *CHILOMASTIX*) was isolated in the same manner. Fairise and Jacquot (1913) report a fatal case of enterocolitis with infiltration of the intestinal wall by *GIARDIA*. "The appearance of *TRICHOMONAS* in the pleural transudates and exudates in man and so frequently in cancers, ulcers and lesions of the mouth, jaws, tonsils, esophagus and stomach, and in liver abscesses, is at least suggestive that it and possibly other intestinal flagellates may have tissue invasive powers in man." Tissue invasion by intestinal flagellates also has been reported conclusively in birds of various sorts, rats, antelopes, turtles, frogs, tortoises, and snakes, and gives further weight to the inference of unexpected capacity of the rhizopods for tissue invasion.

Convincing confirmation of this invasive capacity on the part of amœbæ in man is given by Barrow's case of hypertrophic arthritis of the spine, noted by Reed (11), by the more recent work of Kofoed and Swezy (14, 15, 16), and that of Ely, Reed, and Wyckoff (17) in the identification of *ENTAMOEBA* *DYSENTERIÆ* in the bony lesions of arthritis deformans, and through the recognition of the same amœba in the lymph glands in Hodgkins' disease by Kofoed, Boyers and Swezy (23). Identification of amœbæ in the tissues is made difficult by the similarity of motility and cytology of the human leucocyte and the amœba, but the distinction has been made conclusively along the critical morphologic lines of their characteristic differences in mitosis and chromosome numbers. Inasmuch as the *E. DYSENTERIÆ* has not been cultivated and experimental lesions cannot, therefore, be produced, such cytological evidence, combined with a careful histological study of the iritic tissue changes, must furnish the means of finally proving the exact manner in which the eyes are involved in what I have called "Amœbic Iritis" because of its association with amœbic intestinal invasion. With more extended study

the term may become "Protozoan Iritis," if it should be shown that flagellates also give rise to iritis. In similar fashion our nomenclature may come to include "Amœbic (or Protozoan) Conjunctivitis" and "Amœbic Ulcers of the Cornea" or "Corneal Ulcers associated with Amœbiasis."

Until further clinical, pathologic, and experimental study shall have made clear the exact and immediate cause of involvement of the iridic tissues in these cases of non-dysenteric amœbiasis, the probable means of such involvement are (1) through the mechanical presence of amœbic emboli, (2) through bacterial emboli which have entered the blood stream from the intestinal lesions as a secondary infection. Both of these factors may be active for harm and either may activate the other. (3) The intense systemic depression seen in these cases, almost without exception, is ascribed to toxæmia and the possibility of the absorption of amœbic or bacterial poisons, or of foreign proteid substances through the intestinal lesions and of their possible local effect upon the eye must be mentioned.

Finally, while Reed believes that much of the value of the ipecac treatment is derived from the improved elimination, from the cleansing effect of colonic irrigations, and from a diet designed to reduce putrefactive changes, such a régime gave no benefit to my first case, nor to the fourth case reported, and cure followed the free and persistent case of ipecac and emetin. Likewise in the second case, still under treatment, the first massive dose of ipecac led to a decided clearing of a chronic conjunctivitis, uninfluenced hitherto by intestinal treatment.

The literature concerned with ocular disorders arising from intestinal parasitic infections and especially those of protozoan origin is exceedingly meager. But two cases are reported, one of them being doubtful and the one genuine case of amœbic iritis occurring in relation to an acute dysenteric attack. The possibility of this form of involvement of the eyes is not mentioned in Würdemann's (18) admirable monograph on "Ocular Parasites" and only Elliott (19), commenting on the case of undoubted amœbic iritis mentioned above, seems to have sensed to a degree the pathologic possibilities involved in the relationship. Practically all of the ocular

complications which are recorded as arising during the course of dysentery have been due to bacillary dysentery, in which there is a high incidence of arthritic disturbance, of urethral discharge of non-gonorrheal origin, and often a long course, with frequent exacerbations. In the light of our present knowledge it is conceivable that some of these chronic cases may represent mixed bacterial and protozoan infections, possibly activating each other. Santos Fernandez (20) speaks of the ocular symptoms of bacillary dysentery as falling into a reflex group which includes paresis of accommodation, opacities of the vitreous, and atrophy of the papilla; and an inflammatory group, embracing conjunctivitis, keratitis, and uveitis, produced by the passage of germs proceeding from the colon through the circulatory paths.

Houdart (21) reported that a gunner in the French marines, aged 34, was taken suddenly with pain in the left eye, while convalescing from chronic diarrhoea, acquired during a stay of six months on the River Sargon in China. The next day this eye was found to be blind from irido-cyclitis. A smear made from pus, which had been withdrawn from the anterior chamber by puncture, showed staphylococci and streptococci. The second eye was lost from sympathetic ophthalmitis in spite of enucleation of the first. At the same time an abscess of the liver, which contained sterile pus and which was presumed to be an amoebic abscess, was operated upon.

The only case of iritis hitherto recorded as occurring in the course of amoebic dysentery and in which a definite relation is established between the amoebic infection and the iritis, occurred in the practice of R. Pacheco Luna (22). The patient was a girl of 18 with no history of previous general or ocular disturbance. The onset of iritis was preceded by moderately severe dysentery which lasted one week and yielded to diet and to intestinal lavage with creolin. On the fourth day of her convalescence ocular symptoms appeared and persisted in spite of all treatment. Luna saw her three weeks later, by which time a moderately severe plastic iritis had led to the production of marked posterior synechiæ. These adhesions were broken up by the use of a mydriatic but the redness, photophobia, and discomfort persisted. An examination of the stool, actuated by the history of an antecedent dysentery,

revealed large numbers of *E. DYSENTERIÆ*. No change was made in the local treatment, as in my own non-dysenteric cases, but injections of 0.08*grm.* of emetin hydrochloride were begun, with a daily increase of 0.02*grm.* until 0.12*grm.* was given daily, without inconvenience. Improvement followed the first injection and on the third day the left eye had become free from inflammation. At the same time a considerable diminution was noted in the number of amœbæ in the stool. The right eye cleared after two more injections, local treatment was stopped and no further organisms were found in the stool. The exceedingly rapid conquest of this infection, a rapidity which probably will be seldom duplicated in the chronic iritic infections associated with non-dysenteric amœbiasis, argues for a very recent intestinal infection which was eliminated before it established a firm foothold in the colon. Elliott observes that "this very interesting and instructive case should lead tropical physicians to watch their cases of amœbic dysentery with greater care than ever, especially in view of Houdart's case; indeed it may safely be prophesied that similar records will be added to this one before long. We all of us only too often fail to observe what we are not on the lookout for." Had Elliott conceived the extent to which the human race plays host to the RHIZOPODA and had he understood that dysentery is not the essential sign of protozoan infection, his field of prophecy would have been the wide world instead of being limited to the tropics and to cases of amœbic dysentery.

SUMMARY AND CONCLUSIONS.

1. A small but constant proportion of cases of iritis exists, usually of the chronic, recurring, and intractable type, which arise in association with gastro-intestinal symptoms, but in which the exact causative factor has not been found heretofore.

2. Bilateral iritis occurred in the four characteristic cases reported in association with chronic, marked constipation, extreme lassitude, secondary anæmia, low blood pressure, colonic tenderness, and with *ENTAMŒBÆ DYSENTERIÆ* present in the stools.

3. The sole addition of specific anti-amœbic treatment to the local treatment led to prompt and lasting cure of the iritis and amœbiasis in two of the cases reported, and to prompt symptomatic relief in the two patients still under treatment. Practically every other known form of treatment had been used previously without benefit.

4. The capacity of Protozoa for invading living tissue, both in man and animals, has been recorded indisputably by many observers.

5. Amœbic infection of the human intestine is far more widespread than is generally known, about one tenth of all individuals being affected. The common and incorrect assumption that diarrhœa is the essential sign of such an infection has hindered the earlier recognition of the exact facts. In the temperate zone non-dysenteric amœbiasis is the prevalent form of the infection. Spontaneous cure does not occur.

6. The symptomatology of non-dysenteric amœbiasis is so varied that in all cases of chronic, intractable iritis of uncertain or obscure origin, and especially in those patients who suffer from gastro-intestinal disorders, protozoan and especially amœbic infection must be considered as a possible origin of the ocular disturbance.

7. Iritis arises from amœbiasis by the probable means of amœbic or bacterial emboli which enter the blood-stream through the intestinal lesion, the bacteria coming upon the scene as a secondary infection. It is possible that an additional factor may be the absorption of amœbic or bacterial products by way of the intestinal lesions, especially since the characteristic toxæmia is generally ascribed to this origin.

8. This paper records the first recognized association of iritis and non-dysenteric amœbiasis.

9. The term "Amœbic Iritis" is applied to those cases where the relation between the iritis and the amœbic infection is clearly established. It seems probable that further study of chronic and resistant forms of ocular inflammation will enlarge our knowledge of the rôle played by the intestinal protozoa in their causation. In such an event Amœbic Iritis probably will have become merely a member of the group of Protozoan Iritides.

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CHRONIC GONORRHEAL PROSTATITIS, A POSSIBLE ÆTIOLOGICAL FACTOR IN CERTAIN INFLAM- MATIONS OF THE EYE—WITH REPORT OF CASES.¹

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THE occurrence of gonorrheal infections of the conjunctiva, (1), cornea (2), iris (3), and choroid (4), by metastasis has been fairly well established. The investigations of Byers and others tend to show that these eye infections are manifestations of systemic gonorrhea; that they are apt to occur simultaneously with other metastatic inflammations, such as arthritis and endocarditis, and that the gonococci are probably carried into the general circulation by leucocytes which pick them up from the deeper structures of the urethra. Little attention seems to have been given the prostate as a possible focus in such cases, especially in cases occurring long after the subsidence of the urethral symptoms. The *Ophthalmic Year Book*, since its first issue in 1905, has made but one reference to the prostate—this was to a paper by Dernehl (4), published in *Ophthalmology* in 1915, in which he reported three cases of iritis and iridocyclitis who had suffered from gonorrhea from six to twenty years previously and each of whom still showed gram-negative diplococci, similar to gonococci, in his prostatic secretion. The prostate, however, is not mentioned by Norris and Oliver, Fuchs, De Schweinitz, Weeks, nor by any other American textbook on ophthalmology as far as the writer has been able to determine, except for a single reference in *Medical Ophthalmology*, by A. Knapp (p. 263). This is sur-

¹ Read at Section on Ophthalmology, New York Academy of Medicine, May 21, 1923.

prising when we consider the frequency with which the prostate is infected, and that such infections undeniably give rise to metastatic inflammations. Keyes (5), in the last edition of his book on urology, says: "The prostate is implicated in almost every inflammation of the posterior urethra. Prostatitis is by far the most important complication of genital gonorrhea in the male. It is frequent, it is intractable, it is the source of many grave lesions within the prostate itself, and is a port of entry for systemic gonorrhea." Browning (6), discussing gonorrheal iritis in volume xxxii of the *Ophthalmic Review*, says: "The prostate is often infected with gonococci in these cases, and the urine passed after prostatic massage will often show the gonococcus. . . . An examination of the prostate ought to accompany all efforts in the treatment of obstinate, recurring gonorrheal iritis." Hepburn (7), in his recent book, *The Ophthalmology of General Practice*, says: "The causes of iritis are many, but perhaps the commonest is gonorrhea. The gonococci appear to be capable of remaining latent for many years in the recesses of the urethra and the glands connected with it, and may at any time give rise to a recurrent attack."

From numerous observations, both in general practice and in the practice of ophthalmology, the writer also believes that the prostate frequently harbors the gonococcus, sometimes in pure culture, sometimes as a mixed infection, for many years after the subsidence of the initial urethral infection; that because of its position and structure it becomes a focus comparable to a dental, tonsillar, or ethmoidal focus; and that from time to time bacteria are forced into the general circulation from these prostatic foci and produce infections of the eye.

These prostatic infections fulfill the condition that the pus in such foci should be under pressure, as is the case in apical abscesses, ethmoidal cells and in retrotonsillar abscesses. The prostate is a compound racemose gland, abundantly supplied with muscular tissue, and its ducts are easily obliterated by inflammatory processes, leaving isolated pockets filled with a bacteria-laden secretion. These pockets are subjected to great pressure, both by the passage of hard fecal masses over them in cases with constipation, and by the powerful contraction of the muscular fibers of the gland during the act of ejaculation. This tends to force the secretion into the gen-

eral circulation, the bacteria probably not being taken up by leucocytes as is the case in the urethra, for in chronic infections of the prostate the diplococci are seldom intracellular.

In support of the view first expressed, the following cases are offered, the writer is well aware that in none of them is the evidence sufficient to establish an ætiological relation between the prostatic infection and the eye condition described, but he believes that the presumptive evidence is sufficient to warrant their publication for the purpose of emphasizing the importance of a systematic examination of the prostate in such cases.

This presumptive evidence may be summed up as follows:

1. In each of the cases here reported the patient had previously suffered from gonorrheal urethritis followed by a prostatitis of varying duration, and two of these had been under more or less constant treatment for prostatitis since they were first infected.

2. In each case diplococci resembling gonococci were found in the prostatic secretion.

3. In most of the cases the eye lesion closely resembled the type of lesion usually supposed to be produced by gonorrheal infection of the part involved.

4. In each case the removal of all other discoverable foci either failed to bring about recovery, or, if recovery did take place, there was a recurrence.

5. In each case the treatment of the prostatic focus was followed by a disappearance of the eye symptoms after a reasonable period of time.

6. In no case, as far as the writer has been able to determine, has there been a recurrence after the conclusion of the prostatic treatment.

The cases which follow were all patients of Dr. Arnold Knapp, and it is with his kind permission that I am reporting them. The only connection the writer had with any case was to assist in the various investigations, to examine the prostate, and make suggestions as to its treatment.

CASE I.—C. S. G., aged 49. Diagnosis: Deep marginal keratitis. Was first seen on May 9, 1922. The right eye had then been inflamed for three weeks, and there had

been a similar attack in the left eye six months previously. Vision, right $\frac{3}{8}$; left $\frac{3}{8}$ (with correction). In the right eye there was ciliary congestion, and a number of deeply-placed punctate infiltrates appeared along the margin of the cornea. In the left eye there was a marginal area of fine opacities, vascularized like an old marginal keratitis.

The patient was supposed to have nephritis, and was under treatment for a septic infection of the kidney, but a careful examination failed to substantiate this diagnosis. He had had no other illness except gonorrhea twenty years ago, and had been under treatment for prostatitis ever since. The teeth, nose, and tonsils were negative. His Wassermann was negative. He had some indigestion, but his urine did not contain indican, and he had been on a meat-free diet on account of his supposed nephritis. The urine contained some pus and cylindroids. Examination of the prostate revealed that its lateral lobes were slightly rounded, tense, and somewhat nodular to the touch. They flattened out under massage, and a specimen was easily obtained, which contained diplococci resembling gonococci. He was given urotropin by mouth and gonorrheal vaccine by hypodermic injection, twice a week. Atropin was used locally. After four days the infiltrations at the upper margin of the cornea had healed, though at the lower margin they seemed to have advanced slightly.

June 6, 1922, cornea clear; vision $\frac{3}{8}$. There has been no recurrence.

CASE 2.—J. M., aged 38. Diagnosis: Iridocyclitis. Was first seen on November 23, 1921, when his left eye had been inflamed fourteen weeks without known cause. Vision $\frac{3}{8}$; ciliary congestion, anterior chamber cloudy; posterior corneal deposits present. All tests were negative except his tonsils, which were infected. These were removed, and gradual improvement followed, but on December 27, 1921, there was a relapse from which he slowly recovered, but he did not respond to any definite mode of treatment. On October 11, 1922, he again reported that his left eye had been inflamed for four weeks, coming on apparently after a cold. Wassermann and all other tests were again negative. Vision $\frac{3}{8}$; anterior chamber cloudy; posterior synechiæ. No change in his condition occurred until November 6th, when he became much worse. There were many posterior corneal deposits; his anterior chamber was cloudy; and his vision was reduced to $\frac{1}{8}$. He was again sent to the hospital for a general examination, which was negative, but he now gave a history of having had gonorrhea twenty-five years previously, followed by prostatic trouble. The prostatic

secretion contained many diplococci (some intracellular) as well as many bacilli. Treatment was immediately begun with mixed gonorrheal vaccine, no other treatment being used except atropin locally. In one week his vision had improved from $\frac{1}{200}$ to $\frac{2}{10}$ —. He made an uneventful recovery, and there has been no recurrence.

CASE 3.—C. D., aged 44. Diagnosis: Acute choroiditis. Right, was first seen on January 5, 1918, when he gave a history of diminished sight in his right eye for three weeks. At this time his vision was: Right $\frac{2}{10}$; left $\frac{2}{10}$ —. The right eye contained vitreous opacities and several round foci of choroiditis, with one patch of choroidal exudate. His Wassermann reaction was negative. He had several infected teeth, which were extracted. He reacted slightly to tuberculin, and was given tuberculin treatments, but his vision became steadily worse, and by March 30th it was reduced to $\frac{1}{200}$. He gave a history of having more or less intestinal disturbance, and his stools were sent to a laboratory for analysis, which showed that they were very acid, highly toxic, and contained indol and skatol in large quantity. Colon irrigations and rectal implantation of colon bacilli were commenced, with at first apparently beneficial results, but his intestinal symptoms never entirely cleared up until the removal of his appendix in 1922. Vision did not become normal in the eye until about one year after the first attack. There were frequent recurrences, the sixth—and last—in January, 1923, when his vitreous became cloudy and his vision reduced to $\frac{2}{10}$, but no new foci could be seen. At this time his genito-urinary history was gone into, and it was learned that he had suffered from a severe case of gonorrhea 30 years ago, followed by posterior urethritis and prostatitis for many years. The right lobe of his prostate was swollen and presented an irregular surface. A large quantity of secretion was expressed, and was found to contain many small bacilli and many groups of diplococci. He was given mixed gonococcus vaccine, and his eye condition steadily improved. By March 23d his vision was $\frac{2}{10}$.

CASE 4.—J. P., aged 35. Diagnosis: Acute iridochoroiditis. Was first seen on December 24, 1919, with acute iritis in the left eye, following an intestinal upset of three days previously. Vision in his left eye was then $\frac{1}{200}$, and no details of the fundus could be made out.

Three years before this he had suffered from choroiditis in his right eye, which had responded to eliminative treatment. A most exhaustive examination at this time, however, failed to reveal any indications of intestinal toxæmia,

and no other focus was found except a chronic prostatitis which followed a gonorrheal urethritis fifteen years previously, and for which he had recently been under treatment. The prostatic secretion contained bacilli and many diplococci resembling the gonococcus. He was given gonococcus vaccine, and a genito-urinary surgeon was consulted, who confirmed the diagnosis of prostatitis but did not think it likely that it was still gonorrheal. In about three weeks his eye condition had cleared up sufficiently to permit a fair view of the fundus. A choroidal patch, some pigmented areas, and a fresh exudate could then be seen. The eye condition slowly cleared up, but did not respond promptly to any mode of treatment. This case is of interest chiefly because there was a definite prostatitis that had been under more or less constant treatment for 15 years, and no other focus was found in spite of repeated examinations by expert consultants.

CASE 5.—I. R., aged 47. Diagnosis: Acute iridochoroiditis. Was first seen on August 17, 1918, with acute choroiditis of ten days' standing in the right eye. Vision in this eye was $\frac{2}{80}$ —. There were posterior corneal deposits and in the upper part of his fundus was a large patch of choroidal exudate. An X-ray of his teeth revealed two with apical abscesses. These were extracted. His nasal sinuses and tonsils were negative. His Wassermann and blood chemistry were negative. He had intestinal indigestion, and his urine contained indican, pus, and albumin. A diagnosis of pyelitis and renal calculus had been made, but an X-ray of his kidneys was negative, and his urine became clear after using urotropin for a short time. For his intestinal indigestion he was placed on a meat-free diet, and cultures of the Bulgarian bacillus were given by mouth. In an effort to clear up his eye condition he was also given pilocarpin sweats and mercury rubs. His vision, however, grew steadily worse, and by September 1st it was reduced to $\frac{1}{200}$, and there were many deposits on the anterior capsule of his lens. On September 2d his urine again contained pus, and a genito-urinary surgeon was called, who made a diagnosis of pyelitis. He was again given urinary antiseptics, and his urine slowly cleared up. The eye condition also improved, and by September 30th his vision was $\frac{3}{80}$ —, but on October 4th there was another relapse, from which the eye slowly recovered. On July 25, 1919, another attack occurred when the old choroidal patch showed a fresh exudate at its periphery. He was again sent to the hospital, where all tests were negative except that his urine contained pus and indican. The patient had discovered that his urine

only contained indican when he included grapefruit and cheese in his diet. At this time his genito-urinary history was gone into more thoroughly, and it was found that he had suffered from a severe case of gonorrhea 25 years previously, and that this was followed by a posterior urethritis and prostatitis, for which he had been treated from time to time. His prostate was stripped, and the secretion contained numerous diplococci, many of which were intracellular. He was given gonococcus vaccine and referred to a genito-urinary surgeon for prostatic treatment. The condition cleared up promptly, and by October 22d his vision was $\frac{3}{8}$. He was last seen in May, 1923, nearly four years later. His vision was then $\frac{3}{8}$, and there had been no recurrence.

In examining patients for chronic prostatitis, it should be remembered that in many cases no symptoms whatever are complained of, and the patient may be entirely unaware of his condition. Usually a history of chronic urethritis can be obtained, and often a patient will state that for a considerable time after the constant discharge has ceased, a drop or two have appeared when at stool.

Digital examination of the prostate is best made in the following manner: The patient stands, leaning over a table or chair, with his back to the examiner, who is seated. The patient's legs should be widely separated, or he should rest his right foot on the seat of a chair. The examiner wears a finger cot on his right index finger. This is lubricated with vaseline, and is inserted into the anal passage through the inner sphincter. The two lateral lobes of the prostate are within easy reach and can be readily felt on either side of the median line. Normally the prostate is flattened, presents a fairly smooth surface to the examining finger, and is not tender to the touch. In chronic prostatitis the gland is more prominent than normal, though not as greatly distended, nor as tense, as in acute prostatitis. As the finger is swept across the chronically inflamed prostate it may present an uneven, lobulated surface, and is apt to be tender.

In stripping the prostate, it should be massaged with a somewhat circular motion from the periphery toward the median line, where the posterior urethra can be felt. This massage should be kept up until the gland is flattened out (provided there are no concretions or tumor formations), and

until several drops of secretion have been caught on a glass slide held by the patient. Some physicians obtain the specimen by first massaging the prostate, then having the patient urinate in a graduate. The urine is then centrifugated, and the sediment pipetted out, but the writer has never been able to obtain a good specimen in this way; besides, the specimen is more apt to be contaminated by any bacteria that may happen to be present in the urine. Especial care should be exercised in fixing, staining, and washing the specimen, because it seems to contain an oily substance which prevents perfect fixation. In washing out the excess of stain, water should not be permitted to run directly on the specimen but on the edge of the slide only, so that it will flow gently over the specimen. Washing requires several minutes. Specimen should be dried in the air and should not be blotted, for often the entire specimen will cling to the blotter and be lost.

The treatment that has given the best results is the use of gonococcus vaccine and prostatic massage. When a pure culture of diplococci is found, a straight gonococcus vaccine is used; but when there is a mixed infection, a mixed gonococcus vaccine is used. Stock vaccines are usually employed, beginning with a dose of $\frac{1}{2}$ cc and rapidly increasing the dose to 1 or $1\frac{1}{2}$ cc, the object being to produce a mild reaction after each injection. Treatments were given twice a week over a period of from four to six weeks.

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A CONJUNCTIVAL APRON OR SAFETY FLAP IN
CATARACT EXTRACTION. A PLEA FOR ITS
ADOPTION AS A ROUTINE PROCEDURE.

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(With three illustrations on Text-Plate XXXV.)

ALMOST two centuries have elapsed since Daviel devised and systematically employed the plan of removing a cataract through an incision in the anterior part of the globe. Although his fundamental idea still underlies all present methods, many modifications and advances have been made in the succeeding generations, most of them with the ultimate aim of increasing the likelihood of attaining good visual results. The application of antisepsis and asepsis as well as of local anæsthesia to ophthalmic surgery, needless to say, vastly increased the percentage of successful operations. The judicious use of iridectomy was another valuable contribution. Likewise it may be said of most other modifications in instrumentarium or technic, that it was the aim of their sponsors to obtain satisfactory visual results with a minimum of risk.

To be sure there are men in ophthalmology, as in all other activities of society, to whom the brilliant, the flashy, the hazardous makes a stronger appeal than does the more commonplace, the steady, the secure. These will prefer Smith's operation or Barraquer's phakæresis to the conservative, improved extracapsular methods. Although each method may find its occasional justification under certain conditions and in certain hands, there should be but one determining factor in the choice of operative method to be pursued and

ILLUSTRATING DR. JULIUS WOLFF'S ARTICLE ON, "A CONJUNCTIVAL APRON OR SAFETY
FLAP IN CATARACT EXTRACTION."

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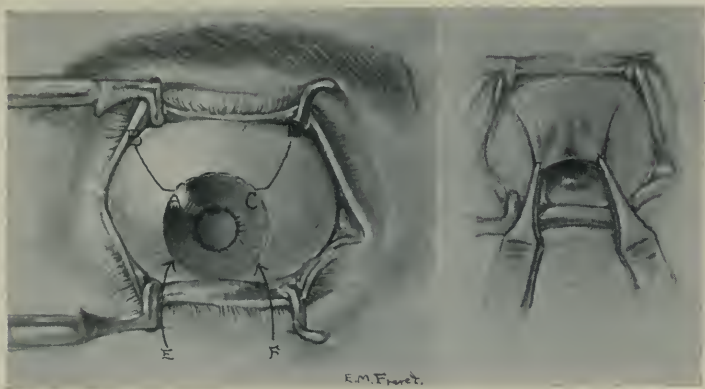


FIG. 1. Showing incisions in conjunctiva, outlining the flap. Insert showing test whether flap is sufficiently freed.

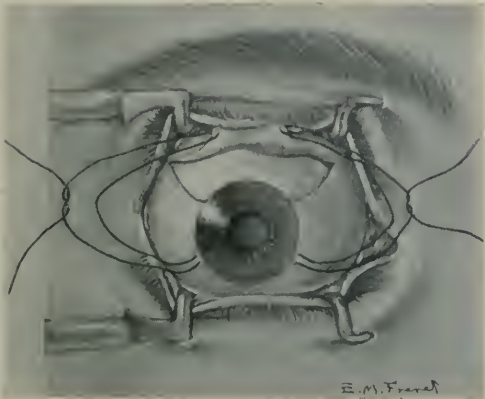


FIG. 2. Showing undermined flap and sutures in place before making the incision with the knife.



FIG. 3. Showing the flap held in position at end of operation.

that is—the Golden Rule. Let each operator ask himself and honestly answer what choice of method he would prefer if he were the patient; I believe the vast majority would lean towards safety.

It is with this object of increased safety uppermost in mind that another safeguard against complications in cataract extractions was, in course of time, resorted to. I refer to the use of a conjunctival flap of one form or another.

Czermak (1) credits Desmarres with having invented and used a conjunctival flap in 1851. Hasner (2), Schweigger (3) and others followed with methods varying from the conjunctival bridge, which is attached at the cornea as well as above, to the subconjunctival pocket of Czermak and the sliding bridge flap of Kuhnt. Gifford (4) states that in 1901–1902 he used a half purse-string suture to draw the undermined conjunctiva from above over the corneal wound in five cases, but gave up the procedure on account of two infections attributed to the suture. Twelve years later he returned to the use of the sliding flap with gratifying results, using, in the main, Van Lint's method of undermining the conjunctiva upwards from the limbus and drawing it down over the upper fourth of the cornea and holding it in place with a suture on each side of the cornea.

A number of other writers report using the sliding flap, but usually only in special cases in which complications threatened. I believe, however, that I am correct in stating that at the present time the great majority of operators who use the extracapsular methods of extraction, rely on the form of conjunctival flap that is attached to the cornea and is formed by making a peripheral section and carrying the Graefe knife up under the bulbar conjunctiva for some distance after it emerges from the anterior chamber. Unquestionably this form of flap is greatly to be preferred to no flap at all, and it is the method that I was taught and followed for many years.

Referring to the advantages of the corneally attached conjunctival flap Wood (5) states them to be the following:

1. It acts as a covering to the wound, thereby protecting against infection from the conjunctival sac. *"The more complete the covering, therefore, presumably the more effective should it be."*

2. It prevents prolapse of the iris by the rapid adhesion of the flap to the underlying tissues.

3. It prevents delayed union.

4. According to Herbert it makes secondary glaucoma a rare occurrence, as any separation of the lips of the incision beneath the conjunctiva leads to a filtering cicatrix.

5. As a minor advantage, it enables the lower lip of the wound to be raised to facilitate iridectomy and delivery of the lens.

The disadvantages accompanying the use of this form of flap are stated by Wood to be these:

1. The iridectomy is made more difficult.

2. To obtain a large flap the section must be peripheral, which results in annoying hemorrhage, a very decided nuisance, as it makes all later steps more difficult.

3. It is difficult exactly to outline the flap as one wishes.

4. The peripheral section predisposes to a "separation of the lips of the deep wound."

The third one of these disadvantages is very much aggravated in those cases in which a preliminary iridectomy has been performed, since the cicatricial adhesion of the conjunctiva to the underlying tissues at the seat of the keratome incision is likely to cause a ragged and fragmentary flap.

Being strongly convinced of the above quoted advantages of a conjunctival covering to the section in cataract extractions, and at the same time being desirous to avoid the disadvantages mentioned, I resorted in several complicated cases of cataract, such as dislocation of the lens, cataract in highly myopic eyes or in patients who threatened to act badly, to the use of a sliding flap, employing at first practically the one used by Van Lint and adopted by Gifford. The results were so eminently satisfactory and the security obtained from the use of this method was so decided that I naturally adopted the same course of reasoning as that expressed by Gifford (6) in these words: "The conclusion seemed inevitable that if such a sliding flap were a safeguard, both against vitreous prolapse and against wound infection, *it ought to be employed as a routine measure in all cataract operations.*"

Accordingly, for about one year, I have used in all cataract extractions a modified sliding flap that I have designated as a

"conjunctival apron," or (at the suggestion of Dr. Charles H. May) a "safety flap."

Van Lint's method of making the sliding flap consisted in detaching the conjunctiva from the upper half of the corneal limbus, undermining upwards and laterally, and anchoring the conjunctiva with sutures sufficiently far down to cover the incision and upper part of the cornea.

Whereas this method fairly met the requirements, I found that the coaptation of the lips of the incision was not sufficiently accurate, as the cornea was likely to be pressed somewhat out of shape by the downward traction on the conjunctiva unless an excessive amount of undermining was resorted to laterally as well as upwards. Furthermore the conjunctiva did not lie smoothly but was drawn into broad folds at the sides of the incision. I therefore evolved the following technic for the formation and attachment of the apron or safety flap, and it has proved to be very satisfactory in more than fifty cases operated upon by me and by Dr. Cyril Barnert who employed the method at my suggestion:

TECHNIC OF EXTRACTION WITH USE OF THE SAFETY FLAP.

Just before beginning the operation and after the toilet and anæsthesia of the eye have been completed a few drops of adrenaline are instilled into the conjunctival sac. The most advantageous position for the surgeon while making the flap is at the side of the patient corresponding to the eye to be operated upon.

The first step in the operation consists in outlining the conjunctival flap. For this purpose two points on the corneal limbus are selected which include between them the upper fourth of the limbus (Fig. 1, A and C). From each of these points a small horizontal incision, two millimeters long, is made through the conjunctiva, and from the ends of these small cuts, diverging oblique incisions are made, the one on the nasal side going in a nasal and upward direction and the one on the temporal side in a temporal and upward direction. The object of the short horizontal cuts is to insure a flap of sufficient width that it will cover the whole incision. After having been outlined in this manner the flap included in the

incisions should be undermined superficially, keeping close to the conjunctiva and detaching it from the limbus between the points A and C. The points of anchorage for the flap are then selected and are located where vertical lines from A and C cross the lower limbus (Fig. 1, E and F). To ascertain whether the flap has been sufficiently freed it is caught with two forceps at the points corresponding to A and C and drawn down to the points of anchorage, E and F, as shown in the insert of Fig. 1. The extent of the undermining and length of the lateral incisions should be just sufficient, so that the approximation can be made without much traction and the flap appears to rest comfortably in place.

In order that no time may be lost in anchoring the flap at the end of the operation, when a critical situation may have arisen, the sutures should now be put in place in the following manner: A single-armed fine silk thread of sufficient length (eight inches) is passed from without through the flap, as close as possible to the free edge and at the point that corresponded to A. The point of anchorage for this suture (E) is then grasped with a fine mouse-tooth forceps and the needle passed *through the episcleral tissue* so that this becomes the fixed point down to which the flap will later be drawn. The two ends of the thread are then crossed twice as in the first step of a surgeon's knot, but the loop is left sufficiently slack, so that it can be shoved out of the way of the succeeding steps of the operation. A similar suture is passed at C and through the point of anchorage at F, and also shoved aside as shown in Fig. 2. At the conclusion of the operation first one suture and then the other is knotted, the flap thereby sliding into place, covering the whole incision and from one half to two thirds of the cornea.

In the majority of cases the anterior chamber begins to reform before the bandage is applied, proving the accurate coaptation of the lips of the wound by the uniform but gentle pressure of the flap on the cornea and sclera (Fig. 3).

While the detailed description of this safety flap may give the impression that it is a complicated matter, it is in reality a most simple procedure, and not more than three minutes should be required for fashioning the flap and placing the sutures.

One important instance of superiority of this flap over the regular flap that is attached to the cornea becomes apparent as soon as the incision is being made. Inasmuch as the safety flap has already been formed and the upper limbus is entirely free, the operator can proceed with his section unhampered by the thought that, in order to succeed in getting a flap, he must make his counter-puncture sufficiently peripheral and must place his section peripherally beyond the limbus. He can place his section exactly in the limbus or even in the cornea, and regulate its size according to the nature of the cataract with which he has to deal. He also avoids, thereby, the annoying hemorrhage that is likely to result from the peripherally placed section.

As stated above, it is often a very difficult matter to obtain a large and efficient attached flap where a preliminary iridectomy has been made, while it is no hindrance whatever in making the sliding safety flap which I have described.

The advantages of the attached conjunctival flap manifest themselves only *after the operation is completed*, during the healing process. At the operation itself it is only a nuisance and the more so, the larger it has been made. It renders an accurate iridectomy more difficult to accomplish, it hampers the introduction and withdrawal of the cystotome or capsule forceps and the removal of cortical remnants; in fact it impedes practically all the steps of the operation. Not so with the safety flap. During the operation it is shoved aside and the clearly exposed limbus allows at all times a view of the whole field and permits the greatest accuracy, ease, and expedition in all the manipulations.

If, perchance, vitreous has escaped and the margins of the incision are separated, the old style flap will be of little use in protecting against infection or in closing the wound, while the dimensions of the safety flap and the pressure exerted by it must make it much more efficient in these respects. Fortunately I have not yet had an opportunity to put it to this test.

The removal of the speculum from the eye at the conclusion of an operation is often an anxious moment for the operator if the patient has become excited and nervous, and not a few serious accidents have occurred during this act. With the safety flap anchored in place the speculum can be removed

with the greatest ease and even squeezing by the patient would not result in trouble, as the speculum cannot engage in the wound.

The further value of the safety flap is revealed in the early days of the after-treatment and consists in the rapid, firm and permanent sealing up of the incision. As stated before, the anterior chamber usually begins to reform while the patient is still on the table, and in every one of our cases it was not only present, but generally was very deep at the time of the first dressing. There have been no instances of filtering scars nor delayed union in the cases in which the safety flap has been employed. I believe I can, therefore, confidently state that with a correctly applied flap of the kind here described *the wound does not reopen after the patient leaves the operating table.*

The corollary to this statement is that prolapse of the iris would be very unlikely to occur and that encouragement to the performance of simple extractions would be given by the adoption of this procedure. In fact, one of Dr. Barnert's and four of my cases were simple extractions. My cases obtained central, round pupils, and in Dr. Barnert's case, which is still under treatment, a perfect result is also in view.

Additional safety may also be afforded to intracapsular operations by the flap in question, although I cannot speak from experience on this point.

Bearing in mind the fact that atropine does not dilate the pupil until the anterior chamber is restored after operation, the immediate sealing of the wound by the safety flap causes the atropine effect to take place much more promptly than it would otherwise, a consideration that is of great importance, especially where considerable amounts of cortical fragments remain.

Since employing the safety flap I have observed fewer instances of striped keratitis than formerly, and in those cases in which it made its appearance, it was trifling. This advantage, also, I attribute to the early resumption of its normal shape by the cornea through prompt closure of the wound; as a result restoration of nutrition through the limbus from above is hastened.

The lessened tendency to re-opening of the incision by the employment of the safety flap gives to the patient the advan-

tage that he may be granted greater freedom in turning in bed and lessens the period of confinement to bed. Formerly I kept patients in bed until the fifth day, but since using the safety flap I do not hesitate to give them permission to sit up on the fourth and sometimes on the third day.

As for the behavior of the flap itself, it was at first a matter of surprise to me to find that it showed no tendency to become oedematous or to add to the reaction following the operation of extraction. In a number of the cases the eye, two or three days after the operation, looked practically as it did when the bandage was originally applied. Occasionally the sutures, even though very fine, cause a moderate foreign body sensation but never enough to be a real annoyance.

After three or four days the flap has fulfilled its purpose and by that time it may have started to draw back into place, and one or both of the sutures may have cut through. Generally on the fourth or fifth day, after instilling a drop of cocaine, I remove the sutures; and this process is rendered easier if they have not been knotted too tightly originally, so that one point of a fine pair of scissors can be introduced into the loop. After the sutures have torn through or have been removed, the flap soon draws back into place and by the time the patient is ready to leave the hospital all evidence of the flap has disappeared.

I am not in a position to make accurate statistical comparisons of the cataract extractions before and since using the safety flap, but in several respects I feel certain that the course of the after-treatment is much smoother and more satisfactory in the latter cases. Iritis has occurred less frequently and ran a milder course, an experience that can probably be ascribed to lessened likelihood of secondary infection from the conjunctival sac. Striped keratitis, as I have stated above, appears very seldom, and then only in a mild form. There has not been one case in the series in which there was any evidence that the wound failed to be permanently sealed up in the first few hours. Consequently there were no cases of delayed union. The iris in each case kept the position into which it was replaced at the operation and no cases of prolapse occurred; nor did incarceration take place when it was possible to make complete reposition at the time of operation.

The visual results were eminently satisfactory; better, I firmly believe, than they would have been on the average without the use of the safety flap. The number of cases operated upon by this method is, however, too small to be of any value for statistics.

The experiences cited above are derived from a rather limited number of cases, but they suffice to give me a feeling of security in facing cataract extractions far greater than ever before. Any observer who has seen this conjunctival apron smoothly and securely drawn over and supporting the large incision, is likely to share this feeling of confidence. I, therefore, consider the designation "safety flap" a most appropriate one and strongly urge its adoption as a routine procedure in all cases of extraction of senile cataract.

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A NEW OPERATION FOR PTOSIS WITH SHORTENING OF THE LEVATOR AND TARSUS.

BY L. DE BLASKOVICS, OF BUDAPEST.

(With nine illustrations in the text.)

NOT one of the numerous operations for ptosis produces a completely satisfactory result, owing to the fact that we lack a proper substitute to replace the deficient function of the levator. The methods now prevalent may be divided into two groups: I. The Method of Substitution, whereby elevation of the lid is accomplished by another muscle. II. The Direct Method, whereby an attempt is made to produce a more efficient levator.

No muscle functions similar to the levator. The muscles used for substitution are the frontalis and the superior rectus. Hess's operation may be regarded as the choice of the former type. Here the cicatricial tissue resulting from the attachment of the skin to the lid forms a tendon-like adhesion to the frontalis. Among the newer methods, Esser's may be mentioned. He fixes a tongue of the frontalis to the tarsus.

The common defect of these and many similar operations is: (1) The elevation of this lid is the result of the mechanical pull of scar tissue by the muscle and not due to the function of the muscle per se, or (2) the direction of pull is tangential. If the pull is too great, the closing of the eye may be incomplete, due to the lack of power of the orbicularis in overcoming the pull of the frontalis. Another end-result of the tangential pull is a frequent eversion of the lid.

The substitution of the superior rectus seems to be a better plan, as its direction parallels the levator. Motais's idea was therefore generally approved. In my experience, however,

I cannot recommend it. The few muscle fibers of the superior rectus, sutured into the layers of the lid, can hardly give any satisfactory results. The effect is not even the result of the muscle pull, but due to the fixation of the lid, to the eyeball, in a higher position. The correctness of this observation proves Parinaud's method, who strove only to produce an adhesion between the superior rectus and the inner lid surface, obtaining a similar result. In these cases the lid can be closed only after the stretching of the few muscle fibers of the superior rectus or of the scar between the lid and eyeball. The function of the superior rectus does not correspond to the levator, for during sleep, following these operations, the eyeball is exposed as a result of the eyeball being turned upward; hence corneal suppurations frequently ensue. For the sake of completeness, I mention Darier's operation. He utilizes the orbicularis. If this substitution could produce any results in spite of the muscle's opposition function, it would be the best proof that all of these so-called myoplastic operations act as a result of the muscle pull per se and not in accord with the particular function of the muscle used.

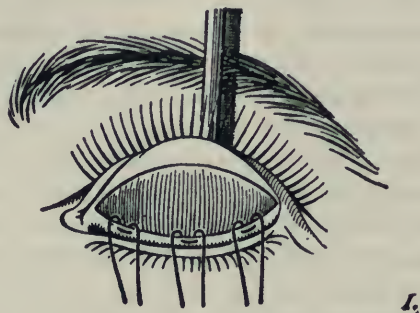
Since no other muscle plays an active part in elevating the lid, the most natural solution would be to seek a direct method to obtain ideal results, the essential factor in this instance being a shortening of the levator. Many authors considered the direct method apparently only in such cases satisfactory where the paralysis of the muscle was not complete. Therefore, the indication for the direct method was chiefly in a paresis of the levator or a ptosis following a paralysis of the sympathetic. The operations of Everbusch, Elschmig, and others proved effective in such cases. In cases of congenital ptosis, however,—chiefly when complicated by epicanthus—the rigidity of the skin plus the narrowed palpebral fissure diminished to a marked degree the effect of the operation, due to a greater force required. In place of the levator in such instances we find merely a layer of connective tissue, interlaced by a few scattered muscle fibers. Similarly, in complete paralysis, when the muscle is inelastic, it is difficult to obtain a sufficient pull, especially as Everbusch does it not only by shortening the levator, but also by folding the tarso-orbital fascia.

Still less effective are operations begun on the inner aspect of the lid, though the levator is here more easily approached and the tarsus shortened. The latter procedure is at least as effective as shortening of the muscle, if we obtain an adhesion between the cut edge of the tarsus and the shortened muscle. From an operative viewpoint, the tarsus may be considered as the rigid continuation of the levator. The shortened tarsus can more easily form a vault upward. Its partial excision is therefore more effective than a similar amount excised from the muscle. Such a type of operation was recommended by H. Wolff, Vicati, Heistrath, Gilet de Grandmont, and Boucheron. However, Wolff shortens only muscle, whereas Vicati, Heistrath, and Gilet de Grandmont narrow merely tarsus. (The last-named author operated from without.) Only the last-mentioned operation can have any result. Boucheron's method seems more effective. He narrows the tarsus and stretches the muscle. However, without muscle resection his results cannot be satisfactory.

Instead of this method, I experimented with an easier one for several years, rendering an account of it at the Sixteenth International Medical Congress of 1909 in Budapest. I shall therefore omit details. Be it sufficient to mention that in the above-cited difficult cases it did not give a satisfactory result. This depended chiefly upon the technique, which I have succeeded in improving to such a degree that it seems worthy of communication, especially so because it is possible, in its present form, to obtain complete results in the most difficult cases of ptosis. The method of the improved operation is as follows:

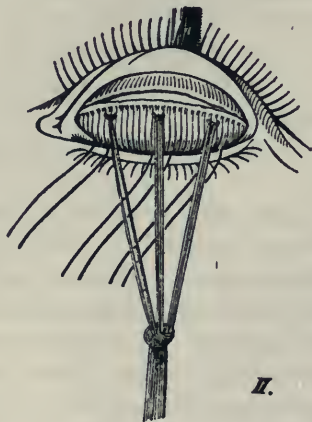
For anæsthesia a 2cc solution of 2% novocaine containing about 3m of 1:1000 adrenaline, to be injected in the fornix. The lid is then everted with a Desmarre's lid retractor, as this instrument not only everts the lid but also vaults the levator, arching the fornix upward. In this position an incision is made along the entire length of the fornix, about two to three mm from the convex edge of the tarsus. The infiltration of the injection prevents an injury to the levator. If the incision is not too near the tarsus, the wound gapes, exposing the muscle to view. Three double-armed sutures are now placed into the lower lip of conjunctiva, so that the loops appear on the epi-

thelial surface, as shown in Fig. 1. These sutures are gathered into the left hand and gently drawn down, while the conjunctiva is carefully dissected away from the muscle, with the right hand, freeing the entire fornix. This is easily performed without injury to the muscle. Releasing the suture causes the



free margin of the conjunctiva to disappear behind the vaulted muscle, with the six ends hanging loosely.

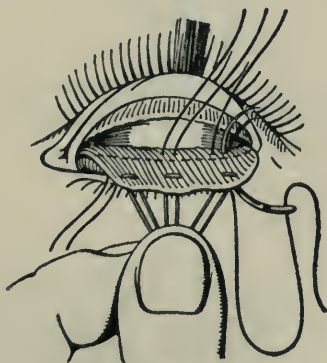
Similarly, three sutures are passed into the muscle, five to six *mm* from the convex edge of the tarsus, each suture including a small bundle of muscle fibers, horizontally placed throughout its entire thickness, as shown in Fig. 2. These serve for



fixation of the muscle only and should immediately be knotted, with their ends tied together, for better manipulation and hold. The muscle is then cut throughout its breadth between

these assisting sutures and the tarsus. The muscle is now drawn down by these sutures, and the surface adjacent to the skin is dissected away with scissors from the pretarsal fascia. Meanwhile, the portion attached to the skin is also cut. This dissection should go deeply into the orbit, so that the muscle can be drawn out to any length. The conjunctival surface of the muscle is now observed to complete the dissection should there be any need of it. By withdrawing and releasing, the elasticity of the muscle is determined, to enable one to judge the proper amount of excision.

The six ends of the conjunctival sutures formerly placed (Fig. 1) are now carried through the muscle in their order immediately behind the site of contemplated resection, as shown in Fig. 3. The muscle is now cut one *mm* in front of

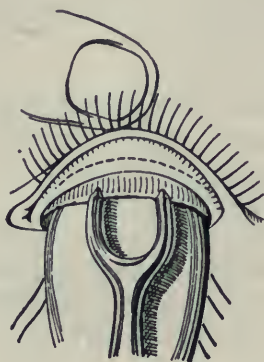


III.

the sutures just passed, taking with it the assisting sutures previously passed into the muscle.

The Desmarre's retractor is now replaced by a spatula placed between the tarsus and the eyeball, the lid is still everted, as shown in Fig 4. A pannus forceps grasps the upper edge of the tarsus and muscle remaining on it and is placed resting on the spatula, so held by an assistant. With the left hand the operator now stretches the free border of the lid as he makes an incision through the tarsus midway between its borders, following the contour of the tarsus, as shown by dotted line in Fig. 4, with his right hand. That portion of

tarsus and muscle to be removed is now cut away with scissors and forceps following the line of incision, leaving the pretarsal

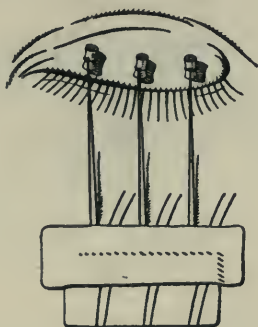
*IV.*

fascia intact. The spatula is then removed, the lid placed in normal position, and the three sutures are now observed hanging out, as shown in Fig. 5.

*V.*

Having properly arranged the sutures, both ends of the middle suture are carried through the lid from within outward just at the level of the cut tarsal border. This is best performed by drawing the lid down with forceps and passing the needle immediately behind the tarsus and emerging through

the skin. The other two sutures are similarly placed on either side equally distant from the middle suture. If the sutures emerge too high, an ectropion may ensue, whereas placing the sutures too low results in an entropion. The sutures are finally knotted over small gauze cylinders and the ends of the sutures utilized to keep the eye closed. The suture ends are drawn down and fixed on the face with two layers of adhesive so that the first strip sticks to the skin, while the second one fixes the returning threads upon the first, as shown in Fig. 6. This



II.

is done to keep the lids closed while the orbicularis is still under the influence of the injected novocaine, for the combination of a paralyzed orbicularis plus a shortened levator results in lagophthalmos. The operation being now completed, the usual bandage is placed over the eye.

On the following day, the orbicularis having regained its function, the traction sutures are cut, to avoid cutting through the levator by too prolonged a traction. The eye is then re-bandaged or a Fuchs mask substituted. On the day following the operation the success of it is marred by the post-operative œdema. However, from day to day marked improvement is observed. The sutures are removed in six days. At the end of two weeks, the result obtained is similar to that immediately on completion of the operation, excepting that now the closure of the lid is free and easy. Fig. 7 shows the end-result of the operation in cross section.

Complications do not occur during or after the operation. If we succeed in resecting the proper amount of tarsus and muscle, the elevation of the lid is normal in the horizontal position, and the curvature is correct. In cases of paresis and post-inflammatory ptosis (trachoma, conjunctivitis eczematosa) the movement of the lids is normal. In total paralysis, congenital and traumatic ptosis, especially in marked cases, the lid invariably lags when looking up or down. This cannot be otherwise. However comparable with other methods of

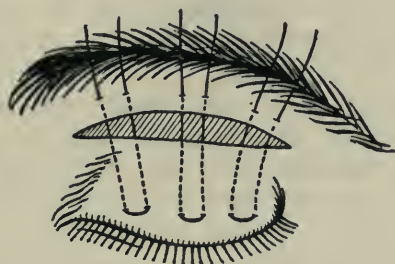


III

substitution, a great difference in results is to be observed. In the most serious cases some movement is seen, though this function be a false one. The pull accomplishes the muscle's work; since the direction of lifting is the correct one. In some instances a blepharo-chalasis-like state resulted, particularly in older patients, where the skin of the lid overlapped the free lid margin. This may be the result of the forward pull of the levator drawing with it the skin. It is, therefore, essential to sever all connections of the levator from the pretarsal fascia. A minor subsequent operation corrects this defect. Originally I excised the fold of offending tissue (three cases), but the results were unsatisfactory. Either the excision was too great, or it was insufficient. I now use a method resembling Hess's operation, taking the precaution not to lift the lid. The skin is incised $\frac{3}{4}$ cm below the eyebrow and undermined down to the lid margin. Three looped sutures are placed into the contemplated height, usually five to six mm from the lid margin running beneath the skin, through the wound and near the eyebrow, passing out through the skin, just below the eyebrow. After the wound is united with a running thread, the three

sutures are knotted over gauze cylinders so as to obtain the desired skin fold, as shown in Fig. 9.

In this operation, as in every ptosis operation, the exact amount of tissue removal is difficult to ascertain. In the description of the methods of muscle and tarsus shortening operations we find variations regarding the degree of shortening. In my opinion, however, these conjectures are incorrect. One *mm* of excision does not produce one *mm* of elevation of the lid, as Wolff states. It is likewise a fallacy to believe that



A.

one *mm* of excision can result in two or three *mm* of efficiency. In my first communication I committed a similar error. It is impossible to formulate any rule expressed mathematically, as the lid shows a different resistance of lifting power in each case. The muscle, the pull of which we augment with the excision, is a more or less elastic ligament. Continued shortening at first distends it, and finally it overcomes the resistance of the lid. Excisions below this degree are ineffective; then every *mm* of excision increases the effect in increasing proportions, since the muscle becomes more rigid and therefore shows a greater resistance. Rigid skins, narrow palpebral fissures, and deep-set eyes produce a greater resistance. Lax skins, wide palpebral fissures, and exophthalmic eyes show a lesser resistance. The active muscle, due to its greater elasticity, has a greater power than the paralytic muscle. A rigid layer of connective tissue instead of muscle, as at times occurs in congenital ptosis, produces a greater result. As a result of these variations, one can obviously see the fallacy of creating

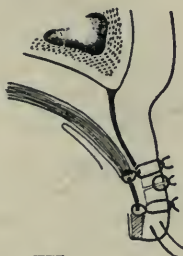
a general rule. Yet, some method of guidance must be had and in exceptional cases the appropriate changes be made.

Generally speaking in cases of moderate resistance and medium elasticity of the muscle the excision should be five *mm* greater than the desired effect. Should one anticipate an unusually great effect, as in cases of sympathetic paralysis, one should make a smaller excision. Anticipating less resistance or marked extensibility of muscle, we perform a larger excision. Less than 5*mm* of excision produces scarcely any results even in the mildest cases. In cases such as total paralysis with narrowed palpebral fissure, rigid skin, or epicanthus, an attempt must be made to excise as much as can possibly be reached.

In measuring the amount to excise, the tarsus is taken at its widest point and the muscle in the relaxed position. The muscle can only be measured following the excision. If the amount is more or less than the desired result, we make corresponding allowances in excising the strip of tarsus. At its widest point the tarsus measures about 10*mm*, thereby giving sufficient leeway for correction, since two or three *mm* of tarsus are amply sufficient to maintain the normal contour of the lid. It must be mentioned that the small tarsus strip improves the result, for in such cases a higher curvature of the lid margin takes place. Regarding the size of the excision—always muscle plus tarsus—I must mention that in cases of total paralysis sometimes a shortening of 20*mm* was obtainable, with super-effect observed. In cases complicated by an epicanthus, the muscle—or connective tissue in its place—is drawn forward with difficulty; thus it is rarely possible to obtain ten *mm* of excision. In such cases the compensatory narrowing of the tarsus will produce the necessary results.

Owing to the difficulty of estimating the proper amount of tissue to be excised, it may sometimes happen that the result is either under- or over-corrected. The former occurred once and the latter instance twice in twenty-one operations. In such cases a second operation is indicated,—naturally several weeks later. If an under-correction results, the excision must be repeated, which is not a difficult task. Diminishing an over-correction is a more complicated procedure. In the above-mentioned cases (paresis, lack of skin, etc.) I proceeded by

passing sutures through the muscle and detaching it from the tarsus and conjunctiva. The incision was made through the conjunctiva. Then proceeding from without, I made a five mm bridgelike strip from the pretarsal fascia and sewed its inferior margin to the tarsus and its superior margin to the muscle, as in Fig. 8. The figure of eight sutures was so placed



III.

that the knot was tied to the skin. Finally, the wound of skin was united. This operation lengthened the muscle with a fascia-strip. The result was perfect.

In twenty-one operated cases there were five total paralytic ptoses, four pareses—two resulted from eczematous inflammation, two were of traumatic origin,—four of congenital ptosis, and four combined with epicanthus. All produced satisfactory results through the original operation, excepting the three instances mentioned. Therefore, I respectfully submit this procedure for ptosis, basing my judgment upon the results obtained from the above stated cases.

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IRIDECTOMY IN GLAUCOMA: A NEW TECHNIQUE.

BY DR. ERVIN TOROK, NEW YORK.

(With four illustrations in the text.)

IRIDECTOMY is still the classical operation for glaucoma and is the one which is performed in preference to other procedures in all cases where its performance promises success.

There are many theories advanced to explain the mode of action of iridectomy. Most of these are only of historical interest and therefore not enumerated in this paper. The one which is generally accepted is based upon the theory that the maintenance of normal intraocular pressure is accomplished by the aqueous being drained off through the spaces of Fontana by the Schlemm canal, thus having a continuous flow. Pathological examinations of glaucomatous eyes show that the spaces of Fontana in glaucoma are obstructed so that the aqueous cannot be drained. This obstruction may be due to the root of the iris being pressed against the posterior surface of the cornea without being adherent to it, or the root of the iris may be solidly glued to the posterior surface of the cornea by organized plastic exudate. This organized plastic exudate may also entirely fill and obliterate Schlemm's canal.

Now pathological examinations of glaucomatous eyes, where iridectomy was successfully performed, but which were enucleated for some other reason, have shown that the reduction of tension was obtained either by the opening of the passage at the iritic angle for the exit of the fluid or by the formation of a new channel by means of a cystoid scar. Therefore a successful operation for glaucoma must either reestablish the natural channel of drainage or form a new permanent

¹ Read before the American Ophthalmological Society, Colorado Springs, June 23, 1923.

channel. This according to Elschmig can be obtained by either detaching the root of the iris from the periphery of the cornea or incising it, thereby producing a direct communication between aqueous and Schlemm's canal. The opening between anterior chamber and Schlemm's canal must be large so that a sufficient quantity of aqueous may be drained off through it to maintain normal intraocular pressure. The reestablishing of this communication can be obtained by a large peripheric iridectomy, by means of which the root of the iris is detached from the cornea and then excised so that it cannot reattach itself again.

This is the universally accepted theory nowadays as to the mode of action of iridectomy in glaucoma. It is self-evident therefore that iridectomy in glaucoma will not be successful if the root of the iris is not detached by reason of faulty technique. These are the cases where a second properly performed iridectomy reduces the tension permanently. It also will be unsuccessful when the root of the iris cannot be detached owing to too firm adhesions. These are the cases where although the iridectomy was performed correctly according to our present technique, the iris tears off anteriorly to the adhesion so that its root remains behind and the iris angle stays obstructed. Finally iridectomy will be a failure even though the root of the iris is detached and excised when Schlemm's canal is obstructed by organized plastic exudate thereby losing its patency.

These latter cases are usually met with in patients suffering from chronic inflammatory glaucoma of long duration especially if they have had one or more acute attacks. Iridectomy is not in order in these cases, but one of the operations which establishes a new channel of drainage such as the Lagrange operation or the trephining.

Now, there is no doubt in my mind that iridectomy is a safer operation than either Lagrange's or Elliot's and therefore preferable to either one. Suffice to mention iridocyclitis and late infections, and I believe that with the exception of the last group mentioned above where Schlemm's canal is not patent, iridectomy, if we succeed in detaching the root of the iris and excising it, will produce a permanent drainage of the intraocular fluid.

As mentioned above iridectomy, as performed according to our present technique, will result in failure in a certain group of cases (where there is firm adhesion between root of iris and cornea) from the iris tearing off at the anterior edge of the adhesion, leaving the root of the iris behind and not establishing communication between aqueous and Schlemm's canal, although the latter is patent. This I attribute to the faulty technique of iridectomy as it is performed to-day. The fault lies in the incision and in the manner in which the iridectomy is performed. Theoretically the incision is to be made 2mm behind the limbus; that is to say exactly at the junction of cornea and sclera,—it is never made there but always anteriorly to this point. This can easily be ascertained by entering the anterior chamber with an iris spatula after incision and pushing the spatula backward toward the corneoscleral junction, holding it close to the posterior surface of the cornea. The angle where cornea and sclera meet can easily be felt and will be found quite a distance behind the upper lip of the wound. Under such circumstances the incision will either lie in front of the root of the iris or it will go through the adherent portion of the iris, bisecting it. When excising the iris either the entire root, or if bisected, its posterior portion, *i.e.*, the one that blocks the iritic angle, will be left behind.

As far as the iridectomy is concerned the fault in technique can be found partly in the manner in which the iris is grasped with the forceps and partly in the way it is excised with the scissors. The forceps are introduced at right angles to the wound and the iris grasped. The traction exerted upon the iris will be parallel with the horizontal meridian of the cornea and a considerable distance away from its root; it can have no effect in helping to detach the adhesion. Later, when the iris is pulled out, the traction is exerted from the pupillary margin toward the adhesion; traction in this direction will have no effect upon the adherent portion of the iris. Finally, when the iris is excised with the scissors the fold is first cut at the right hand end of the wound; then with a slight traction it is pulled over into the left hand end of the wound where it is excised with the second cut of the scissors. The traction thus exerted will be parallel with the adhesion and therefore will tear the iris off along the anterior edge of

the adhesion, leaving the root behind and the iritic angle blocked.

The root of the iris will be removed by this technique only in cases where the adhesions are very weak and loose, or are not effected by connective tissue but by fresh plastic exudate as in acute attack of glaucoma.

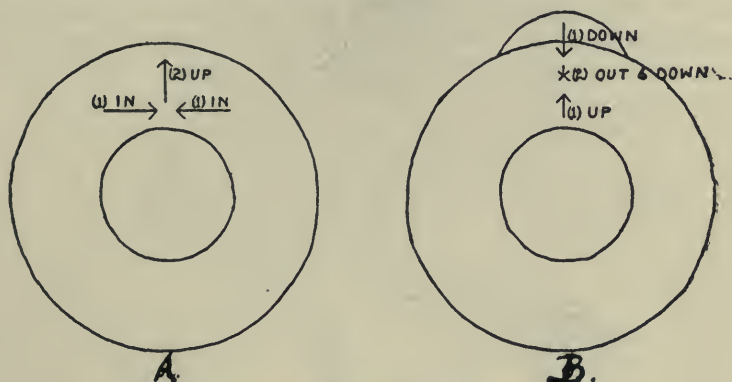


FIG. 1.—Schematic representation of traction in:

A—Present technique; B—New technique.

1. Shows direction in application of forceps. 2. Shows direction of traction in delivery of iris. (Drawn by Dr. G. E. G. Norton.)

These faults in technique may be remedied by:

1. Making the incision with the Graefe knife instead of keratome.
2. Detaching the root of the iris with a spatula before making the iridectomy.
3. Grasping the iris with the iris forceps parallel to the vertical meridian of the cornea.

Following these suggestions an iridectomy on a glaucomatous eye will be performed as follows:

The eyeball is fixed in the limbus at either end of the horizontal meridian of the cornea with a double fixation forceps such as Schweigger's or one similar to it. This will greatly facilitate the section as it will eliminate the rotation of the eyeball, a complication which is most disturbing. The incision is made above, puncture and counter puncture being in the sclera, and the section terminating behind the limbus with a conjunctival flap. It is similar to the one made in Lagrange's

operation but not carried quite as obliquely through the sclera, the cutting edge of the knife having been turned forward when the corneoscleral junction (2mm behind the limbus) is reached. If the iris prolapses after incision it should be carefully replaced. The conjunctival flap is now grasped with an anatomical forceps and gently pulled forward making the wound gape thereby. With an iris spatula, holding it always in close contact with the sclera, the root of the iris is detached throughout the whole extent of the wound and if one wishes the spatula can easily be pushed still further forward between ciliary body and sclera as far as the suprachoroidal space. The ciliary



FIG. 2.—Detaching the adherent root of the iris. (Drawn by Dr. G. E. G. Norton.)

body is thereby detached and a cyclodialysis from the anterior chamber performed. If one always keeps the spatula in close contact with the sclera, there is no danger of injuring the ciliary body or losing vitreous.

The assistant now takes the anatomical forceps and keeps the wound gaping by means of traction on the conjunctival flap and the surgeon grasps the iris with the iris forceps. This is done by introducing the forceps parallel with the wound, one blade being placed near the root of the iris, the other one a few millimeters below. The forceps is now closed and the iris drawn out, gentle traction being exerted forward and slightly downward toward the patient's feet and excised with two

sweeps of the scissors. The scissors are held parallel with the wound and placed upon its posterior lip by holding them slightly tilted so that one blade is actually in the anterior chamber. The pillars of the coloboma are now replaced if necessary, the conjunctival flap smoothed out and a bandage applied.

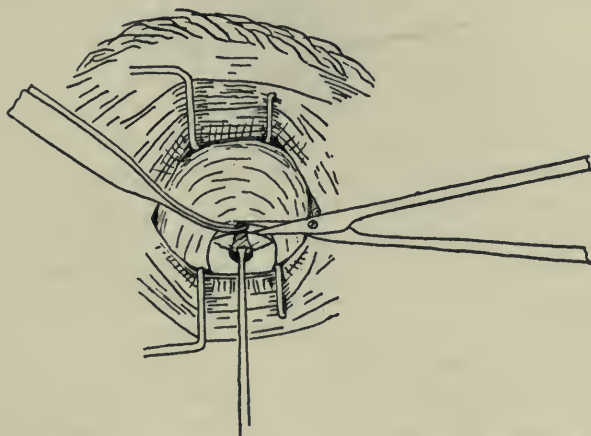


FIG. 3.—Excision of iris; showing application of forceps, delivery of iris and position of scissors. (Drawn by Dr. G. E. G. Norton.)

Now, the advantages of this technique as I see them are as follows:

1. The incision with Graefe knife will give a good, large peripheric incision with a conjunctival flap of any desired size. The knife will be less liable to injure or even bisect the adherent root of the iris and the wound obtained will readily gape, thereby facilitating the subsequent manipulations with the spatula.

2. The detaching of the adherent portion of the iris from the cornea before iridectomy will assure us of opening up the iris angle and reëstablishing communication between aqueous and Schlemm's canal. It is logical to assume that this manipulation will be successful in all cases, with, perhaps, the exception of those of long standing chronic glaucoma where the iris is much atrophied and friable. Under these circumstances the spatula probably will not penetrate between root of the iris and sclera so that no actual detachment will take place—

it will, however, tear the iris and the trabecula of the pectinate ligament, thereby opening up the iritic angle and establishing the desired communication between aqueous and Schlemm's canal similarly to the action of an anterior sclerotomy, with the exception that the subsequent excision of the iris will prevent the closure of the opening thus obtained. This is an important point as it would speak in favor of this method as compared with anterior sclerotomy.

As mentioned above, the spatula may be carried forward between ciliary body and sclera as far as the suprachoroidal space thereby performing a cyclodialysis and opening up the suprachoroidal space also, giving still another channel for the draining off of the intraocular fluid. I mention this with the full knowledge of the fact that pathological examinations have shown that in cyclodialysis the ciliary body does not remain detached from the sclera but becomes firmly adherent to it again, the beneficial effect of this operation being attributed to the opening up of Schlemm's canal rather than to the communication between anterior chamber and suprachoroidal space. Here again, then, the fact that the iris is excised would be a point in favor of this operation as compared with cyclodialysis as no reattachment can occur.

Elliot, speaking about the "new operations for glaucoma" says the following:

"It is admitted that the later the case the worse the prognosis, and that this in part, perhaps in large part, depends on the fact that the advance of the iris, owing to its adhesion to the sclerocornea, makes the attainment of a uvea-free fistula more difficult and more hazardous." If this be so, then it would seem to me that detachment of the root of the iris before iridectomy in trephining, as well as Lagrange's operation would be to a great advantage and would give us a permanent fistulous opening in a greater number of cases. The manipulations with the iris spatula can easily be performed through the trephine opening and also through the wound.

3. The technique of the excision of the iris together with detaching it from the sclera will secure the opening of the iritic angle by removing the root. To grasp the iris parallel with the vertical meridian of the cornea and draw it out with gentle traction forward and slightly downward will tend to pull the

iris away from the sclerocorneal junction and bring its root within the action of the blades of the scissors. This is still further facilitated by holding the scissors slightly tilted. The previous detachment of the adhesion will absolutely eliminate the possibility of tearing off or cutting off of the iris along its anterior attachment to the cornea and sclera.

I have so far performed this operation within the past year and a half on twenty-seven eyes, and the results obtained are quite satisfactory. Of course, time is too short and material too limited to draw any conclusions from them. The operation, however, seems logical to me and the result so far encouraging enough to warrant its publication and recommendation to the medical profession. The technique does not present any special difficulties or any special dangers.

INFLAMMATORY PSEUDOTUMOR OF THE ORBIT.¹

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(*With ten illustrations on Text-Plates XXXVI and XXXVII.*)

INFLAMMATORY pseudotumor of the orbit is a rare clinical condition which in most instances cannot satisfactorily be diagnosed without microscopic examination of the tissue involved. The condition is characterized by disturbance of motility of the eyes, proptosis usually with lateral displacement of the eye in the affected orbit, swelling of the lids and increase in the bulk of retrobulbar tissue. As the quantity of tissue in the depth of the orbit increases, the eye becomes rather firmly imbedded, so that it cannot be pressed backward. The onset is slow, and not accompanied by the usual symptoms of inflammation.

That the swelling of the orbital tissue and the consequent proptosis are inflammatory, is borne out by the microscopic appearance of the tissue rather than by symptoms and complaints of the patient, or the gross appearance of the mass at removal. Birch-Hirschfeld drew attention to the inflammatory character of the tissue, and suggested an infectious origin of the disease; his opinion is in harmony with the subsequent observations of Stargardt. The finding of focal infection elsewhere in the body preceding or accompanying the signs of orbital tumor, also makes the infectious character of the condition seem probable. Such focal infections usually

¹ Read before the New York State Medical Society, New York City, May, 1923.

ILLUSTRATING DRS. BENEDICT AND KNIGHT'S ARTICLE ON "INFLAMMATORY PSEUDOTUMOR
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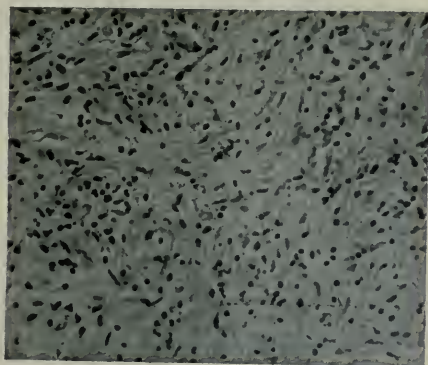


FIG. 1.

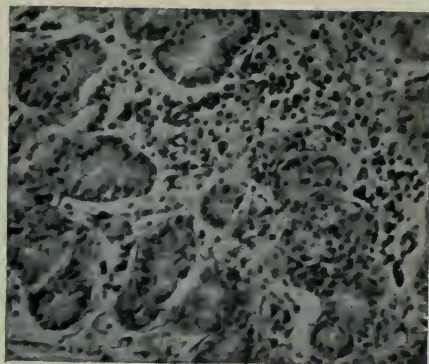


FIG. 2.



FIG. 3

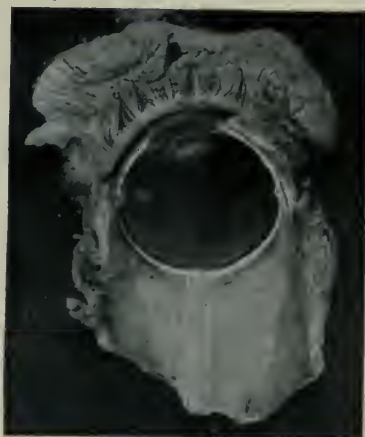


FIG. 5.



FIG. 4.

ILLUSTRATING DRs. BENEDICT AND KNIGHT'S ARTICLE ON "INFLAMMATORY PSEUDOTUMOR OF THE ORBIT."

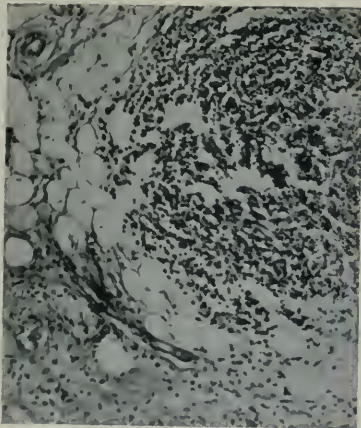


FIG. 6.

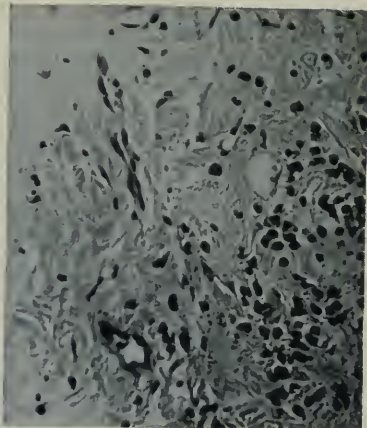


FIG 7.



FIG. 8.



FIG. 9.

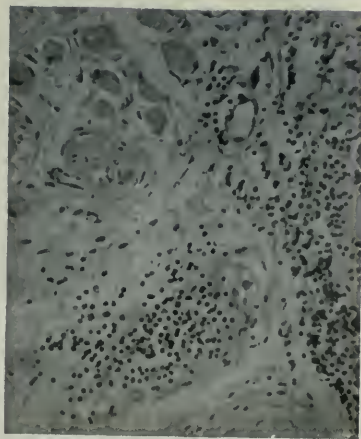


FIG. 10.

do not cause symptoms, and are either overlooked or disregarded as ætiologic factors in the production of the orbital swelling. The patient usually is not suffering from the infections, and the absence of fever, high leukocyte count, and local pain, serve to differentiate pseudotumor from the common inflammatory processes within the orbit. In all cases reported, the syndrome of benign or malignant tumor was present. Under the administration of drugs certain suspected neoplasms disappeared, although specific action of the drug used could not acceptably be ascribed except in cases believed to be due to syphilis or tuberculosis. Other cases of suspected neoplasm of the orbit have come to operation without a tumor being found; in still others masses have been found in the orbit, which on microscopic examination proved to be inflammatory and without characteristics of neoplastic formation.

Birch-Hirschfeld's classification of pseudotumors has been followed by most writers in reporting such cases; we also shall adhere to this classification in the consideration of our cases. The grouping of inflammatory pseudotumor of the orbit is as follows

Group 1. Cases in which the syndrome of benign or malignant neoplasms is presented clinically, but in which recovery is spontaneous, or on administration of drugs, such as potassium iodide, mercury, and quinine.

Group 2. Cases in which the diagnosis of orbital tumor is made on the clinical picture, but the tumor is not found when the orbit is opened.

Group 3. Cases in which a tumor is diagnosed at operation, but on microscopic examination is found to consist of chronic inflammatory tissue.

Since the publication of Birch-Hirschfeld's review of the subject, we have been able to find reports in the literature of only five cases of pseudotumor of the orbit. None of these reports was printed in the English language. This would lead us to believe that inflammatory pseudotumor of the orbit is a very rare condition, yet its clinical significance cannot be disregarded, as six cases have come under our observation within the past three years. The paucity of published reports of well studied cases justifies the recording of these cases in

detail. Three of the six cases belong to the second group, and three to the third group of Birch-Hirschfeld's classification.

Group 2. CASE I (A338840), Mrs. J. H., aged forty-seven years, came to the Clinic, October 25, 1920, because of protrusion of the right eye, with swelling around and particularly below the eye of three months' duration. The patient, feeling that her teeth were the cause, against the advice of her dentist, had some bridge work removed and teeth extracted. The following day she had severe pain in the right temple; the swelling increased and the eye protruded. The pain was almost constant for a time and was relieved only by narcotics, but when she was seen at the Clinic ten days later, the pain had largely subsided.

On examination there was marked proptosis of the right eye with drooping and oedema of the upper lid, the most prominent swelling being at the upper inner angle of the orbit. The eye was divergent and there was limitation of movement in all directions, more marked upward and inward. The pupil reacted rather sluggishly to direct light, more promptly to consensual light. The fundus was negative except for slight pallor of the temporal half of the disk. Examination of the left eye was negative. Vision was $\frac{3}{8}$ right eye, and $\frac{1}{8}$ left eye. Examinations of the urine, and the Wassermann reaction were negative. The leukocyte count was 8,200; a differential count was not made. The tonsils and nasal accessory sinuses were normal. A roentgenogram of the head revealed bony changes around the right orbit and the right parietal region of the calvarium, indicating destruction and repair of the bone in the region involved. A careful neurologic examination was negative, except for some small sensory changes on the right side of the face, the ptosis, and disturbances of the ocular muscles. The patient gave a history of migraine which made it difficult to judge whether the pain was due to the condition within the orbit.

A diagnosis of orbital tumor was made and the orbit explored through an incision in the brow. No mass could be palpated in any part of the orbit. The wound was closed without removing any tissue, and it was noted that the degree of exophthalmos had not been changed by the operative interference. The wound healed promptly and the patient was dismissed three weeks after the operation. At this time the proptosis had receded somewhat and it was hoped that it would continue. However, the patient still complained of the pain.

Two months later a letter was received from the physician

the patient consulted after leaving the Clinic, stating that the proptosis and pain had increased. Orbital cellulitis had been suspected and the eye was removed. No tumor was found in the orbit behind the globe and the enucleation did not relieve the pain nor explain the proptosis.

CASE 2 (A308271), F. P., a girl, aged seven years, was brought to the Clinic, March 6, 1920, because of protrusion of the right eye. She had been well until five weeks before, when she came home from school with slight swelling of the right lower lid, which steadily grew worse and spread to the upper lid. There was no definite history of injury. Within a few days after the onset of the swelling the chemotic conjunctiva protruded between the lids, the eye was red and proptosed, but the cornea was clear and vision unaffected. Three operations, the nature of which was not known, were performed elsewhere within four weeks, with no relief. There was slight pain in the eye when the swelling first started, but later the pain was severe in the head, side, and arm. The child had lost weight, but her appetite was good; she had not vomited.

At the first examination, made five weeks after the onset of the swelling, there was marked exophthalmos of the right eye and some swelling in the right temporal region. The lower lid was hidden by the chemosis of the lower ocular and palpebral conjunctiva, which projected between the lids. The upper lid overhung the upper two-thirds of the proptosed globe, but the lower third of the cornea was exposed and ulcerated. There was no œdema of the left lids and the left eye appeared to be normal. The right side of the soft palate was swollen slightly. The temperature was 100.2° , the pulse 140. The erythrocytes numbered 4,150,000, leukocytes 9,600, polymorphonuclear lymphocytes 71.5, small lymphocytes 22.5, large lymphocytes 5.5, and basophils 0.5. A roentgenogram of the head was negative, the blood count was normal, and except that the patient was weak and drowsy, an examination of her general condition was negative. The cornea had sloughed badly and was on the verge of rupturing. The swelling was thought to be due to tumor, and immediate removal of the eye and tumor was advised.

General anæsthesia was used for the enucleation. The ocular conjunctiva below was much thickened, apparently infiltrated with tumor, and was freed from the eyeball with difficulty. The globe was adherent to Tenon's capsule, and when freed was found to lie in a shallow socket of tumor tissue which filled the orbit. The orbit was thoroughly exenterated, and the upper lid, which was infiltrated, was

removed. The bony walls were intact; the tumor was apparently primary in the orbit. Recovery was uneventful. The patient was well two years later.

Microscopic sections, largely of young connective tissue, were taken from several parts of the tumor; lymphoid and polymorphonuclear cells were found scattered throughout. In one section small groups of fat cells were surrounded by the leukocytes; in other sections were muscle fibers in which the striations were well preserved, although there was much infiltration around the bundles (Fig. 1). A part of the lacrymal gland was also sectioned. Some of the secreting cells showed degenerative changes, and other acini had completely disintegrated leaving only fragmented cells. The stroma of the gland was generously infiltrated with lymphocytes (Fig. 2).

CASE 3 (A420388), Mrs. A. P., aged sixty-four years, came to the Clinic, March 15, 1923, five weeks after the left orbit had been exenterated elsewhere. For three months before the operation the patient had noticed diplopia when looking to the left. About one month before, a sudden sharp, shooting pain marked the onset of proptosis of the left eye. Soon after this both lids became deeply discolored and a serous bloody discharge appeared in the cul-de-sac. The patient was taken to the hospital and the orbit exenterated three days later.

Examination revealed the right eye to be normal. The left orbit was clean, and filling in with healthy granulations. Examination of the nose and throat was negative, but a roentgenogram of the accessory sinuses disclosed clouding of the left antrum and both frontal sinuses. The general examination was negative except for chronic myocarditis and constipation.

The pathologic report from the laboratory where the operative specimen was examined read as follows: "Sections through various portions of extra-orbital tissue show a great deal of extravasation of blood into the tissue substance, and a diffuse round-cell infiltration of an inflammatory character. In some portions there are islands of cells which look like epithelium and have the appearance of a metastatic epithelioma."

The two sections of tissue which were loaned to us for examination, revealed only hemorrhagic and leukocytic infiltration, which consisted largely of polymorphonuclear forms. The sections contained fat and striated muscle. The muscle fibers had not lost their striations, but there was much hemorrhagic and leukocytic infiltration among them. However, the infiltration was most dense around

the blood vessels. Here there were also numerous endothelial cells which may have been mistaken for "metastatic epithelioma" (Fig. 3).

Group 3. CASE 4 (A406278), W. H. D., a man aged fifty-three years, came to the Clinic, September 29, 1922, complaining of protrusion of the left eye which had persisted for three months. The proptosis had appeared suddenly, reached its height in two months, and had remained stationary. Diplopia also developed. The lower lid became swollen, and uncontrollable drooping of the upper lid developed. Pain occurred at intervals, but was never severe. The previous winter a bilateral epiphora had been troublesome, and the ducts were probed. Two weeks after the onset of the proptosis in the left eye, an acute dacryocystitis developed in the right lacrimal sac, ruptured and cleared up. There was no history of other eye trouble. Six weeks before coming to the Clinic the patient had had an operation on the nose to clean up sinuses which were thought to be the cause of the proptosis (Fig. 4).

On examination the right eye appeared to be normal. Vision of the right eye was $\frac{1}{2}$, of left eye $\frac{1}{8}$. The left upper lid covered the globe, and was swollen and oedematous. The lower lid also was thick and swollen. The larger vessels of the conjunctiva were tortuous and injected. The cornea was clear; the anterior chamber was normal in depth, and the pupil reacted promptly. The eye diverged, was depressed 0.5 cm, and could not converge. Motion was limited, and diplopia was present in all directions. There was no visible lesion of the fundus. Exophthalmometer readings were right eye 15, left eye 28. The lower margin of the orbit was barely palpable, and was encroached on by a spongy mass which was either thickened lid or neoplasm. A small mass just behind the upper inner orbital margin could be palpated. In an examination of the blood 5,300 leukocytes were counted. The differential blood count was lymphocytes 21.5 per cent., large mononuclears 4.0 per cent., transitionals 3.5 per cent., neutrophils 70 per cent., eosinophils 0.5 per cent., and basophils 0.5 per cent. A serum Wassermann reaction was negative. The patient gave a history of recurrent vertigo and intermittent chills and sweats of many years' duration, the cause of which was not determined. Except for atrophy of the right middle turbinate, the nose and throat examination was negative, but roentgenograms showed that both antrums were very cloudy. Examination by the neurologists did not disclose evidence of a brain tumor or of extension of the tumor from the orbit. A diagnosis of malignancy in the orbit was made,

and the removal of the tumor, or exenteration of the orbit if necessary, was advised.

October 4th, an incision was made through the left brow, and the superior and nasal periorbita were elevated. The palpating finger found a large firm tumor which extended from the globe to the apex and completely filled the posterior half of the orbit. As it was impossible to remove the tumor alone the orbit was exenterated (Fig. 5).

The patient recovered uneventfully, and a week later went to his home where the family physician cared for the wound. He returned for observation two months later. The orbit was filling rapidly with granulations, the surface was clean, and partially epithelialized.

Examination of the tissue removed which included the lids, globe, and tumor, showed that the tumor was firm, white, conical in shape, and with its base firmly attached to the globe behind the equator. The optic nerve and the muscle cone were involved in the tumor which apparently had replaced the orbital fat. The periphery was more dense and fibrous than the central portion. The area within the muscle cone around the optic nerve was white and stippled with round, translucent yellowish areas 1 to 2mm in diameter. Microscopically the periphery consisted largely of dense fibrous connective tissue. The collagen fibers were large, abundant, and almost hyaline in appearance. Scattered liberally throughout this tissue were plasma cells and lymphocytes. Occasional small groups of fat cells were seen surrounded by numerous infiltrating cells, and thin walled blood vessels. Near the center of the section the mass contained more fat and numerous young fibroblasts, and the connective tissue was less dense than at the periphery. For the most part, the lymphocytes were collected into groups resembling follicles, and the plasma cells were scattered throughout the tissue between (Figs. 6 and 7). The size and distribution of these groups corresponded to the translucent dots seen in the center of the gross specimen. The extrinsic muscles were diffusely infiltrated with lymphoid cells, and practically all the small vessels showed endarteritic changes. In some instances these changes had progressed to obliteration. Except for scattered areas of lymphoid infiltration in the choroid, the globe itself was not significantly changed.

CASE 5 (A403390), Miss E. T., aged thirty-five years, came to the Clinic, August 30, 1922, because of swelling of the lids of the left eye. The left upper lid had swollen nine months before; this subsided completely within three weeks, and there was no more trouble except one or two slight

recurrences until ten days before her examination, when the left lids became markedly swollen and diplopia appeared.

On examination the right eye was found to be normal. The left eye was 4 to 5mm lower than the right. The left upper lid dropped and was edematous. On palpation a soft fluctuant mass was felt extending from the inner canthus to the outer margin. There was some fullness of the lower lid and the ocular conjunctiva was thrown into folds at the outer canthus. There was no apparent limitation of movement of the eye, but diplopia was elicited on extreme elevation. The external examination of the globe was negative. Exophthalmometer reading of the right eye was 17, of left eye 23. There was no lesion in the fundus (Figs. 8 and 9). The patient had an adenomatous thyroid which was producing no symptoms. She gave a history of glycosuria accompanying the first attacks of swelling but on general diet not even a trace of sugar was found during the six days she was under observation in the hospital. No differential white count was recorded. The erythrocytes numbered 4,680,000, the leukocytes 10,500.

A diagnosis of orbital tumor was made and removal advised. An incision was made in the brow and the periorbita incised at the orbital margin. Immediately beneath it lay a soft, white, friable, not encapsulated mass 1.5cm by 1cm which was removed. The wound healed promptly and the patient was dismissed from observation a week after the operation. Six months later she sent a recent photograph; there was no swelling, and only slight ptosis.

The microscopic section was very cellular. Lymphocytes predominated but eosinophiles were conspicuous and there were also endothelial leukocytes. The wandering cells were not uniformly distributed, although they were present throughout the section, but were concentrated into fairly large groups between which were seen areas of young fibroblasts. Small groups of isolated fat cells were seen where the process had invaded fatty tissue.

CASE 6 (A396255), Mrs. J. G. S., aged forty-four years, came to the Clinic in June, 1922, because of exophthalmic goiter. The left superior thyroid vessels were ligated and two weeks later the gland was resected. There was no record of any eye symptoms at that time. In January, 1923, the patient returned complaining of inability to raise the eyelids. This difficulty had appeared one week before, and diplopia, on looking upward, was noticed soon afterward.

On examination the right eye appeared a little more prominent than the left. Both upper lids were somewhat puffy but not discolored. The bulbar conjunctiva on the

temporal side of the right eye was slightly chemotic. The lateral movements of the eyes were good, but they could not be elevated above the horizontal plane. Otherwise the eyes were normal. The diagnosis of conjugate paralysis was made and observation advised.

The patient returned to the Clinic in April. At that time a soft mass could be palpated in the upper inner quadrant of the right orbit. Proptosis and exophthalmos of the right eye were marked. In the primary position the right eye was turned down and out. External ocular movements were normal except elevation. Binocular attempts to elevate showed a moderate amount of elevation of the left eye in all fields. The right eye moved up very slightly in the field of the inferior oblique. Exophthalmometer readings were right eye 23, left eye 17. The patient returned again in two weeks, saying that the tumor was growing and the vision of the right eye rapidly failing. The general appearance of the eye had not changed, but the patient complained of shortness of breath and was quite nervous. Examination by the neurologist revealed only paralysis of associated ocular movements. Examination of the urine and the Wassermann reaction were negative. The erythrocytes numbered 4,600,000, the leukocytes 8,000. No differential blood count was made. In view of the patient's general symptoms and anxiety it was deemed best to remove the tumor at once.

An incision was made just below the brow and the periorbita incised between the superior and internal rectus muscles. A fairly large soft tumor was felt extending along the line of the internal rectus muscle. It was dissected free, excised at the apex, and the wound closed. Recovery was uneventful.

The operative specimen was a rounded, flattened, pinkish, fairly firm mass, measuring 20mm in diameter and 6mm in thickness. One side was covered by a thin glistening fibrous capsule and some loose fatty tags were attached to it. The other side seemed to have been cut, and frayed ends of muscle fibers projected from the surface.

The microscopic sections were made up largely of degenerating muscle, and fat tissue. The fiber bundles stained poorly, and some were vacuolated. The section gave the impression that a certain number of bundles were shrunken and smaller in diameter, and others had completely disappeared leaving blank spaces. The tissue was infiltrated with lymphocytes which tended to collect around the blood vessels. There were also a smaller number of plasma cells and endothelial leukocytes. There were no signs of malignancy nor of an acute inflammatory process (Fig. 10).

DISCUSSION.

In none of these cases was the clinical course of long duration. In the majority, symptoms appeared about three months before they became severe enough to cause the patient to seek medical advice. In one case (Case 5) swelling of the lids had occurred nine months before, but soon subsided and the onset of the real attack occurred only ten days before the patient's first visit to the Clinic. This agrees well with other cases reported in which the duration of symptoms was from ten days to one year.

The disease was sudden in onset, or there was exacerbation of symptoms in most of the cases. In several the symptoms began insidiously and fluctuated for some time, then became severe and constant. In two of the cases (Cases 2 and 4) there was no prodromal period.

The ætiology of the condition is not known. Marbaix and Van Duyse insist that the orbital neoplasm is only one expression of a general systemic disease in which lymphocytosis is a constant finding, and that the blood count will aid materially in the diagnosis. This was not true in the cases here reported. The two instances in which the differential white count was recorded, showed no evidence of lymphocytosis.

Lafon suggests recurrent hemorrhage of unknown origin as a cause. At first these are absorbed, but finally organization and proliferation of the orbital connective tissue forms a fibromatous pseudotumor. Case 3 may belong to this class; at least the sudden onset quickly followed by discoloration of the lids and bloody serous discharge, and the pathologic picture seem to point to hemorrhage.

Practically all the writers on the subject refer to infection as a direct ætiologic factor, and this theory seems to fit the facts in several of our cases. In Case 1 the orbital swelling seemed to be associated with dental infection and a marked exacerbation immediately following the opening of this focus by extracting the teeth. The patient in Case 4 had been treated for six months for bilateral chronic purulent dacryocystitis, and roentgenograms also disclosed clouding of both antrums. Birch-Hirschfeld gives a full description of the classical patho-

logic picture of pseudotumor of the orbit, to which Case 4 corresponds. The orbital tissue studded with groups of lymphocytes resembling follicles with an outer ring of plasma cells, the endarteritic changes, and the absence of all signs of malignant growths, form the characteristic picture. Case 6 also corresponds fairly closely to this description. Marked exophthalmos had persisted longest in these two cases, approximately three months. The pathologic picture in the other three cases studied varied considerably. In Case 2 in which several attempts had been made to drain a supposed abscess, the picture was greatly altered by the secondary infection. Hemorrhage was a complication in Case 3; there were also evidences of an acute rather than a chronic inflammatory process (many polymorphonuclear leukocytes). Sections from tissue in Case 5 showed the follicular arrangement of the lymphocytes, but the plasma cells were absent and eosinophils were conspicuous. The absence of plasma cells speaks for a shorter duration of the process, and in these last three cases marked symptoms had persisted only a relatively short time (three days to five weeks). This would lead one to the conclusion that the pathologic picture depends in no small part on the age of the lesion, and that these atypical types are only younger pseudotumors.

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LEGENDS.

Fig. 1 (A308271). Secondary polymorphonuclear leukocytic infiltration, (probably due to the operative interference) of the new formed connective tissue. X200.

Fig. 2 (A308271). Lymphocytic infiltration of the lacrimal gland. X200.

Fig. 3 (A420388). Infiltration of muscle fibers with hemorrhage and concentration of the leukocytic infiltration near the blood vessels. X200.

Fig. 4 (A406278). Patient when first seen.

Fig. 5 (A406278). Longitudinal section of gross specimen.

Fig. 6 (A406278). Follicular arrangement of the lymphocytes in the central portion of the tumor mass near the optic nerve. X100.

Fig. 7 (A406278). Denser peripheral portion of mass consisting of fibrous tissue with infiltration of plasma cells. X200.

Fig. 8 (A403380). Before operation.

Fig. 9 (A403380). Six months after operation.

Fig. 10 (A396255). Degenerating muscle fiber bundles. Follicular arrangement of lymphocytes with peripheral sprinkling of plasma cells. X200.

REPORT OF THE PROCEEDINGS OF THE SECTION
ON OPHTHALMOLOGY OF THE NEW YORK
ACADEMY OF MEDICINE.

By DR. BEN WITT KEY, SECRETARY.

MEETING OF MARCH 19, 1923. DR. ELLICE M. ALGER, CHAIRMAN.

Dr. GEORGE H. BELL presented a patient, aged 30 years, having a non-magnetic **foreign body** in the globe of the right eye. When first seen two months before there was a hole in the iris, dislocated lens and plastic exudate in the anterior chamber. X-ray at three different times revealed a foreign body, 1mm x 1mm, just back of the iris. Three attempts to dislodge the foreign body with the magnet had failed. Dr. Bell requested a discussion as to the proper procedure in the case, since the plastic exudate had persisted, although tension was normal and vision equaled hand movements. He had advertised enucleation which the patient refused.

DISCUSSION: Dr. A. E. DAVIS suggested enucleation.

Dr. J. B. SMITH proposed iridectomy. He had had a similar case in which the foreign body was attached to the iris or capsule. With iridectomy the foreign body was removed and the result satisfactory. He regarded this as a possibility before resorting to enucleation.

Dr. C. E. McDANNALD suggested palliative measures and observation until acute or more definite symptoms should indicate enucleation.

Dr. BELL in closing stated that he thought it unwise to perform iridectomy and attempt removal of the foreign body because of the low-grade infection and the plastic exudate remaining in the anterior chamber.

Dr. D. SMITH presented a case of multilocular **cyst of the**

iris in a boy, aged 7 yrs. Foreign body (steel), 4 x 1 mm, had penetrated the globe, which was removed by the posterior route. Traumatic cataract absorbed. Four months after the injury a large multilocular cyst filled the anterior chamber. Before operation could be performed he was struck in the eye by a base-ball, from which there was considerable reaction, and hypertension developed. Iridectomy, evacuation and removal of the cyst through the original wound was then performed. Several months afterwards the cyst returned, as demonstrated in detail by transillumination. Tension of the eye was normal and projection good. Dr. Smith questioned the form of procedure now indicated.

Dr. T. B. HOLLOWAY read a paper pertaining to **refraction from a scientific standpoint**. He also exhibited a demonstration eye, of service in demonstrating the various principals of optics as well as the various errors of refraction.

A paper entitled "**Applied Refraction—The Art**" was read by Dr. A. E. DAVIS.

In dealing with the methods of testing and adjusting glasses to the eyes, the question of the use of cycloplegics was first discussed. The writer never uses a cycloplegic in patients over forty years of age. In patients under fourteen years of age, in strabismus cases, and in all patients where the vision can not be improved to normal, a mydriatic or a cycloplegic is used. It is therefore the exception and not the rule that he employs cycloplegics. In opposing the routine use of a cycloplegic in daily office practice, Dr. Davis referred to the difference frequently found in the manifest and cycloplegic refraction, whereas the manifest correction is that best suited to the patient. Furthermore the prescribing of $\frac{1}{4}$ D cylinders, with axis $\frac{1}{2}$ degrees as to accuracy, and prisms of $\frac{1}{4}$ or less is overdone, impractical and of no benefit to the patient. In this connection he "raised a word of warning against over-refinement in prescribing glasses"; one must not depend implicitly upon objective tests, but rather give full credit to subjective tests which really control the final decision in prescribing.

Dr. DAVIS described in some detail his methods of procedure in making both objective and subjective tests of the refraction, and concluded with the following:

1. Application of lenses before the test cards should be limited to 15 min.

2. Always correct first the astigmatic error, if present, then apply spherical lenses.

3. After testing each eye, test both eyes by attempting to increase the spherical if hypermetropia, or to decrease it if myopia.

4. Always begin the test with plus lenses.

5. Test cards should be placed slightly higher than patient's head, because this relaxes convergence and incidentally the accommodation.

Dr. J. W. WHITE presented a paper on **refraction** and the **phorias**. He appealed for a routine determination of muscle balance as a measure important and interesting in the consideration of the correction of errors of refraction. After defining and classifying the phorias, he layed stress upon the screen test as being the most reliable and rapid method to employ, applicable in all cases of phoria and in the youngest child. The routine test should consist of:

1. Deviations for distance, measured by the screen test.

2. Deviations for near, measured by the screen test.

3. Convergence near point, by the technique of Duane.

4. Excursions of the eyes in the six cardinal fields.

5. Test of the accommodation with an approximate correction of the ametropia.

In making a diagnosis, Dr. White specified the limits of exophoria or esophoria for distance and near, as indicating divergence excess or insufficiency and convergence excess or insufficiency. If the exophoria or esophoria should increase in looking to the right or left, it is then not a divergence or convergence anomaly but an insufficiency or excessive action of an individual muscle. A vertical deviation may be an anomaly of sursumvergence but nearly all will be found to increase in some particular field, proving an elevator or depressor to be paretic.

As to treatment, he recommended the following: (1) In divergence insufficiency, prism diverging exercises or wearing prism base out in distance glasses,—or better still, advancement of one or both external recti. (2) In divergence excess, prisms base in are indicated, but most relief results from

tenotomy or recession of one or both externi. (3) Convergence insufficiency is improved by correction of ametropia and by converging exercises. Advancement of one or both internal recti may be indicated. (4) Convergence excess if in a hypermetrope should receive full correction; if in a myope, may need an undercorrection. (5) Hyperphorias may be relieved by prism correction, although operation in a vertical deviation is often indicated.

DISCUSSION: DR. ALEXANDER DUANE stated that he makes a subjective test, securing all the tests possible to produce relaxation, and also makes the accommodation test. He darkens the room somewhat till the patient can just see the test type in order to produce relaxation in some degree. He employs homatropine and finds it reliable in the vast majority of cases. If a + 3.00 D lens is added to the atropinized eye, vision should be clear at $33\frac{1}{3}cm$ or at the 3 D line on the Prince rule. The near point should be just within this point, and if not, more homatropine should be used. One advantage of cycloplegia is that it is valuable not only in the objective but in the subjective tests. Dr. Duane recommends the use of sphero-cylinders in testing for the axis and cylindrical correction in astigmatism. Cycloplegia serves very well in people of middle age, and in fact more commonly than in children.

Dr. G. H. BELL agreed with Dr. Davis about prescribing small cylinders at random and correcting very small errors of astigmatism with the rule. He disagreed with Dr. Davis about homatropine being a pseudo-cycloplegic, and insisted that homatropine paralyzes the accommodation just as well as atropine, if it is properly employed. He has abandoned the use of atropine in refraction, only prescribing it in high myopia cases where absolute rest is important.

Dr. T. B. HOLLOWAY in closing the discussion stated that he uses cycloplegics regularly; homatropine usually, atropine in children. He rarely does a manifest refraction but rather prefers a post-cycloplegic refraction.

MEETING OF APRIL 16, 1923. DR. ELLICE M. ALGER, CHAIRMAN.

Dr. J. W. SMITH reported a case of **an eye injury complicated by scarlet fever**. The unusual coincidence of trauma occurring

in an eye of a patient during the incubation period of scarlet fever and the infrequency of eye complications in this disease are worthy of record.

A boy, aged 9 years, was seen 36 hours after being struck over left eye by a sharp stick. There was marked oedema of the left eyelids without ecchymosis; no sub-conjunctival hemorrhage but slight oedema of ocular conjunctiva; cornea normal, vision normal. Two days later there was marked swelling of the orbital parts and exophthalmos, pain over the right mastoid area and swelling of the submaxillary and cervical glands; temperature 103.2°. Diagnosis of scarlet fever was made, and two days later his sister aged 11, also developed scarlet fever. With the progress of the disease, the lids of the left eye became dull red, exophthalmos increased, superficial gangrene of the conjunctiva with adhesions made its appearance, also limitation of ocular movements downward, later upward and to the right. Mastoiditis, left side, developed rapidly, was operated upon without event.

The outstanding local features of the case were, the absence of ecchymosis after trauma to the eye-lids, membrane formation on the palpebral conjunctiva, blanching and partial gangrene of the ocular conjunctiva, exophthalmos, partial and later complete limitation of ocular movements, with recovery of normal vision and other functions. The general features were, a mild nephritis, convulsions of the Jacksonian type, and acute otitis media, mastoiditis and mastoidectomy. The patient was discharged, cured, seven weeks after the onset of his injury.

Dr. D. B. KIRBY presented a case of **bilateral sixth, seventh, and twelfth cranial nerve paralyses** (published in full in previous issue of Archives).

DISCUSSION: Dr. A. DUANE stated that the lateral movements were associated and also there was convergence. The fact that the patient fails to follow a moving object, but follows when turning the head to one side, may indicate a lesion above the nuclei, but this seems most unusual and it probably is a case of agenesis of the nuclei of these nerves.

Dr. S. A. AGATSTON presented a technique for **muscle recession** in place of tenotomy in the correction of squint, and reported the results of 26 cases thus operated upon.

Briefly the technique is as follows: After exposing the muscle in the usual manner, and holding it forward on a strabismus hook, a double-armed suture is passed through the muscle with the loop on the scleral side 3mm beyond the line of insertion. Complete tenotomy is now made, when each needle is inserted into the episclera at a point on a line to which it is intended to recede the muscle, passing the needle horizontally toward the original insertion for a distance of 2mm, then emerging pass the needle through the original attachment, picking up the conjunctival margin which has retracted to the inner canthus. The course of the upper and lower needles should be about 4mm apart. The suture is now drawn forward and tied, the conjunctival wound being thus closed over the muscle stump.

The author emphasizes the following points in favor of the operation,—its simplicity, brevity, comparative painlessness, exactness of correction, the fact that in moderate deviations it makes tenotomy a useless operation, and advancement or resection unnecessary.

DISCUSSION: Dr. P. C. JAMESON stated his interest in this subject was due to the fact that he had presented a paper before the American Ophthalmological Society in May, 1922, with the same idea and similar technique as that brought forth by Dr. Agatston. He does not regard the recession operation as one which does away with the advancement, and has not proposed this. Recession can be done with as much accuracy as advancement. The muscle should be anchored to the sclera for this renders the effect more exact. Dr. Jameson is no longer timid about suturing the sclera, since his experience in this operation has shown him the ease with which it can be accomplished. Recession takes tenotomy out of the region of uncertainty and places it upon a more certain basis. Five millimeters is as far as one can recede the internal rectus; 8mm as far as the external rectus can be receded. A recession of 5mm will correct twenty-five degrees of squint.

His observations of results after recession were numerated as follows:

1. Uniformity of results. 95% of corrections have given uniform results.

2. No divergence follows the operation, but an insufficiency of rotation at times may occur probably due to placing the internal rectus further back than 5mm.

3. There is protection of convergence and active motility is retained.

In summary he stated that the recession,—1st. Primarily attacks the offending muscle, thereby correcting the defect at the seat of the deformity. 2nd. It leaves an unmutilated muscle system capable of normal action and vigorous work. 3rd. It enlarges the effect of tenotomy by carrying the muscle end back to the equator if necessary, and renders tenotomy by reason of scleral fixation a safe and reliable procedure. 4th. It safe-guards convergence to a striking degree. 5th. Its corrective capabilities are extensive and comparatively uniform.

DISCUSSION: Dr. ELBERT S. SHERMAN asked what suture material is used and how long before the sutures are removed. Dr. Agatston replied that the braided silk sutures are removed on the sixth day.

Dr. A. E. DAVIS inquired as to the effect, if recession is made back of the equator of the globe. Dr. Agatston had not seen any failure of muscle action following operation.

Dr. H. V. HUBBARD presented a preliminary report of an **advancement operation by over-lapping**, with report of six cases.

Technique: The muscle is exposed by a single meridional incision through conjunctiva and Tenon's capsule. It is then picked up and stitched on two strabismus hooks, and grasped by two pairs of advancement forceps 2mm apart, at a distance from the muscle insertion of about $1\frac{1}{2}$ times the number of millimeters of shortening desired. The muscle is then divided between the forceps and the cut end overlapped by drawing the cut end and the muscle over the tendon, well up to its insertion. Two sutures of No. 3 black silk are passed through conjunctiva, matted through muscle and tendon together and out through conjunctiva on the opposite side, one near the tendon insertion, the other near the cut end of the tendon. These are removed on the tenth day. Tenotomy of the opposing muscle may be also necessary.

Advantages of this method are:

1. No sinking of caruncle because of horizontal incision.
2. No danger of injury to sclera by needles.
3. Less liability of sutures to tear out from delicate muscles.
4. No disturbance of tendon insertion and consequent vertical deviation.
5. Amount of correction easily governed by amount of overlapping.
6. Simplicity.

Six cases are reported, in four of which the overlapping operation was performed on one muscle with tenotomy of the opposing muscle. Results showed parallelism in four cases, and binocular single vision in three. In two cases of 20 degrees of convergence, the operation was performed on both external recti, without tenotomy, five to eight degrees of convergence resulting.

DISCUSSION: Dr. A. E. DAVIS had witnessed two or three of these operations, and regarded it as a very neat and simple procedure and one which definitely strengthens the muscle.

Dr. J. W. WHITE asked if the speaker meant binocular single vision or the eyes straight and in parallelism?

Dr. HUBBARD replied, yes, binocular single vision as tested by stereoscopic pictures.

Dr. A. J. HERZIG asked how much overlapping is required for a given amount of squint. He replied, *imm* of overlapping to correct five degrees of squint, was attempted in calculating the degree of effect.

Dr. A. J. HERZIG: What is the extent of the tenotomy, if necessary. Dr. HUBBARD: It varies with the case.

Dr. RAY R. LOSEY: Are these not very perfect results in the number of cases reported? Reply: They certainly are.

Dr. H. H. TYSON: Is this not the same operation as the one Dr. H. Knapp performed some years ago, in which he folded or knuckled the muscle instead of cutting it off? Dr. HUBBARD: The same except that the muscle here is divided and overlapped.

The paper of the evening, entitled, "Recurrent ocular paralysis," was read by Dr. A. DUANE, and is published in full in the July Archives.

REPORT OF THE TRANSACTIONS OF THE OPHTHAL-
MOLOGICAL SECTION OF THE ROYAL SOCIETY
OF MEDICINE.

BY MR. H. DICKINSON, LONDON.

A meeting of the Section was held on Friday, June 8th, under the presidency of Mr. A. L. Whitehead.

CASES

Mr. H. M. JOSEPH showed a case of **progressive macular changes associated with tremors**. The patient was a woman aged 34. $2\frac{1}{2}$ years ago she had tremor of the right hand, but no visual defect. When he saw her for the first time 2 years ago there were light spots about both maculæ, and the corrected vision was $\frac{6}{12}$. Since that date the spots had greatly increased in number. Vision had now fallen to $\frac{6}{18}$, and the tremor was more marked and extensive. Wassermann was negative.

Dr. RAYNER D. BATTEN regarded the case as an adult instance of cerebro-macular disease. Probably the same toxin might be at work, producing different symptoms at different age periods. Infantile, juvenile and senile types were now recognized, and the present case seemed to supply the missing link, the adult type. He entered into the reasons why he held that view, and showed slides of various cases he knew of.

Mr. F. A. JULER referred to a case under Mr. Leslie Paton, a boy aged 18, which Mr. Paton diagnosed as cerebro-macular degeneration, and said he, Mr. Paton, regarded it as a connecting link between amaurotic family idiocy and later cases of cerebro-macular degeneration.

Dr. GORDON HOLMES said he was familiar with this tremor since the epidemics of lethargic encephalitis. He did not suggest that this patient's condition was a sequel to lethargic encephalitis, but he thought the area of brain affected agreed in the two conditions. The most important pathological lesion in these cases was disease in the substantia nigra and in the neighborhood of the mesencephalic nuclei; it seemed to be a primary degeneration of certain portions of the gray matter of the brain.

The PRESIDENT said that in the cases of encephalitis lethargica he saw he had not noted any fundus changes, a curious fact if the basal ganglia were affected.

Familial Nodular and Reticular Keratitis.

Mr. MONTAGUE HINE read a paper on this subject, based on three cases shown. This family, he said, helped to demonstrate a close connection between the two conditions which did not appear so obvious when seeing individual cases. Mr. Basil Graves, who examined these three cases with the corneal microscope, aptly described the appearance as a "fine sheeny speckling," and suggested that the tissue might be impregnated with a fine translucent granular deposit, which might have a refractive index different from that of the cornea. Both eyes showed the same change. The girl, aged 10, gave a history of slight headache, but no special intolerance of light. Right vision was $\frac{6}{12}$, left $\frac{6}{8}$. In her the opacity consisted of a number of fine lines, many of which were seen to be composed of tiny dots; but the lines here did not form a meshwork, but remained separated and uncrossed. One line suggested an obliterated vessel, resulting from previous inflammation. In the left cornea there was a combination of two of the linear opacities with several of the small rings, similar to those in her brother.

The mother, aged 36, said that her eyes had worried her since infancy; she had not had them examined before February last, when she came to be tested for glasses; R. vision was $\frac{6}{18}$, left $\frac{6}{12}$. The central area of the cornea was seen to be studded with numerous, rather closely-set grayish-white opacities; some in the form of rings, others nodular, while

in places the nodules became confluent. The periphery of the cornea was clear in each eye.

The boy, aged 14, gave a history of severe headaches and intolerance of light since infancy. His cornea showed very similar changes to those seen in his mother. There was one child whose eyes were normal. In all the cases the Wassermann was negative, but the maternal grandfather was said to have had syphilis.

Mr. H. NEAME spoke of a case under Mr. Fisher's care who had lines of opacity in one eye, and nodules in the other; the lines appeared to be about the middle of the substantia propria.

Tuberculous Conjunctivitis.

Mr. R. L. REA showed a young woman, aged 23, with tuberculous conjunctivitis, in the form of ulcerative patches on the lids of both eyes. He had arranged for her to be sent to Leysin, in Switzerland, to have the direct sunlight treatment, from which he had seen there very good results. He hoped to show her again after she had received that treatment.

The Embryology of Congenital Crescents.

Miss IDA C. MANN read a paper on **Some Suggestions on the Embryology of Congenital Crescents**, which was supplemented by some excellent micro-photographs and drawings shown by the epidiascope. The main thesis is as follows:

The group of cases under consideration are characterized by the fact that they are congenital, stationary, not necessarily associated with any one error of refraction, and situated, in 70% of the cases, below the disk. There is, apparently, some factor which determines the greater proportion of inferior crescents, which must be sought in the normal development of the disk, since an abnormality is more likely to be associated with a normally existing embryonic structure than it is to arise *de novo* as a pure aberrance. The embryonic structure in this case is the choroidal fissure. The presence of congenital crescents in other situations does not detract from the fact that the choroidal fissure is the determining

factor in the inferior type. The presence of the fissure will merely account for the preponderance of this type, since the essential condition for the formation of a crescent is that the pigmented outer layer of the optic cup should not reach quite up to the insertion of the optic stalk. The presence of the fissure merely allows of this occurring more easily below the disk than elsewhere. From the illustrations shown it can be seen that the essential difference from the normal consists of the failure of the pigment epithelium and nuclear layers of the retina to reach the edge of the optic disk in its lower part; hence there is a small area below the disk in which all the elements of the retina except the nerve fiber layer are absent, so that this layer is separated from the sclerotic only by a very thin extension of the choroid. Developmentally it has been shown that eversion of the unpigmented layer of the optic cup normally takes place in the upper end of the choroidal fissure. This is seen in a large number of vertebrates. In some animals, including man, the small everted portion of the inner layer loses its connection with the rest of the inner layer and disappears, but in some other types (birds) the connection is retained and nerve fibers grow into the everted projection. If in man the everted portion developed aberrantly and retained its connection with the inner layer, a condition resembling that normally present in birds might result. Such a condition is present in a congenital inferior crescent, which bears a striking resemblance to the structure of the lower part of the disk of the normal bird.

The occurrence of crescents other than inferior, i.e., the failure of the pigment epithelium to reach the edge of the disk in other situations, is comprehensible in the light of the work of the late George Coats, who showed that any one part of the optic cup may differentiate into tissues resembling that normally derived from another part.

The failure of the choroid and occasional thinning of the sclera in the crescent has its parallel in normal development. The mesoderm in contact with the outer layer of the optic cup differentiates into choroid, while that in contact with the inner layer—whether inside the cup or everted along the fissure—does not. The scleral condensation, in its turn, follows the developing choroid.

It may therefore be said that congenital crescents in any situation are due to the failure of the pigment epithelium to reach the site of implantation of the optic stalk. This failure may occur anywhere, since aberrant differentiation of the various parts of the secondary optic vesicle is known to occur. It is, however, much more likely to occur below the disk than elsewhere, since it is normal here at one stage of development in man. Hence the greater frequency of inferior crescents, which can be looked on as developmentally homologous with the cauda of birds, the architectural basis of the cauda being present, though small, in the normal human embryo. The failure of the choroid is directly correlated with the absence of the pigmented epithelium, and the occasional failure of the sclera has its parallel in the retardation of condensation along the fissure during development.

The PRESIDENT complimented Miss Mann on her exposition and the beauty of her slides.

Sir WILLIAM LISTER argued that the inferior crescent was a retraction crescent, similar to the ordinary retraction crescent of myopia occurring at the macula.

Sir JOHN PARSONS agreed with Miss Mann's view, but in many cases the condition was associated with failure in closure of the choroidal fissure. With regard to the myopic so-called retraction crescent—a term he did not like—he thought this was probably an atypical coloboma, and that it had no relation to a stretching of the walls of the globe associated with myopia.

Miss MANN replied that the presence of staphyloma of the disk could also be explained as part of the retardation of the sclerotic condensation along the lines of the fissure. She agreed that myopic crescents also had a congenital explanation, though in them some pathological process was superimposed.

Mr. P. DOYNE read a brief paper on the Tourney reaction, and it was discussed by Mr. J. H. FISHER and Mr. RAYNER BATTEN.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by DRs. A. N. ALLING, New Haven; M. J. SCHOENBERG, New York; T. H. BUTLER, London; P. G. DOYNE, London; and K. WESSELY (*Archiv für Augenheilkunde*), Würzburg.

Edited by MATTHIAS LANCKTON FOSTER, M. D., F. A. C. S.,
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(Continued from September issue.)

II.—REMEDIES AND INSTRUMENTS.

24. ALBRICH. Results of iontophoresis. *Zeitschr. f. Augenheilkunde*, xlv., No. 6, p. 391.
25. BIRKHÄUSER. Clinical results and experimental studies concerning iontophoresis, particularly the avoidance of lesions of the epithelium, and the treatment of corneal opacities. *Klin. Monatsbl. f. Augenheilkunde*, August–September, 1921, p. 333.
26. BLATT. Digestive treatment of corneal scars. *Ibid.*, p. 322.
27. FUCHS. Fifty enucleations with Seidel's infiltration anæsthesia. *Archiv f. Ophthalmologie*, civ., No. 4, p. 351.
28. GIFFORD, S. R. Some facts about salicylate therapy. *American Journal of Ophthalmology*, December, 1922.
29. HAAB. How one can study in his own eye, the cornea, lens, and anterior part of the vitreous. *Münch. med. Wochenschr.*, 1921, p. 728.
30. JENDRALSKY. Parenteral milk therapy. *Zeitschr. f. Augenheilkunde*, xlv., pp. 27 and 95.
31. LIEBERMANN. Treatment of eye diseases, especially gonorrheal ophthalmia, with injections of milk. *Ibid.*, xlv., p. 199.
32. MANS. Treatment of scrofulous eye diseases with injections of milk. *Kindertuberculose*, i., p. 45.
33. SANDMANN. Protein body therapy in ophthalmology. *Münch. med. Wochenschrift*, 1921, p. 1571.
34. SCHWARZKOPF. Iontophoresis treatment of corneal ulcers. *Klin. Monatsbl. f. Augenheilkunde*, June, 1921, p. 879.
35. VOGT. Erroneous diagnoses with the slit lamp microscope with special reference to phantoms. *Archiv f. Ophthalmology*, cv., p. 507.

36. WIESE. **Milk injections in eye diseases.** *Zeitschrift f. Augenheilkunde*, xlv., No. 6, p. 339.

ALBRICH (24, **Results of iontophoresis**) obtained 99 per cent. of cures in 588 cases of infectious corneal diseases, 97 of the cures within the first week. The trophoneurotic cases, 154, were cured within a few days. The results were less satisfactory in parenchymatous keratitis. Scrofulous troubles are favorably influenced. In trachoma iontophoresis is a very helpful aid.

BIRKHÄUSER (25, **Iontophoresis**) thinks that the injuries of the corneal epithelium observed after iontophoresis, no matter how carefully it may be applied, are not due to the cocaine, nor to the iontophoresis itself, but are purely mechanical. These he tried to avoid by means of an apparatus so constructed that only the electrolytic fluid came in contact with the cornea, yet epithelial defects could be regularly detected by fluorescein. Then he found that if he wrapped the metallic electrode with cotton, when it was the cathode, these defects were avoided. He believes in the clearing up of corneal opacities by iontophoresis and reports concerning ten cases of old corneal scars, in nine of which he obtained a distinct, in some a considerable improvement of vision. The treatment requires patience, as about thirty sittings must be expected, each two minutes long, giving iodine chloride iontophoresis with a current of two milliamperes. Much more iodine is carried in this way through the cornea than by simple diffusion. In the discussion of this paper Siegrist remarked that as yet he had been unable to convince himself that old corneal opacities cleared up under the influence of iontophoresis.

SCHWARZKOPF (34, **Iontophoresis treatment of corneal ulcers**) tested the iontophoresis treatment on twenty-seven bad, progressive cases of *ulcus serpens*, and is less enthusiastic about the value of this treatment than some writers. Yet he obtained fourteen cures and three cases of temporary improvement. Many patients suffer severely. One good thing about the treatment is that if it fails it does not prevent the successful use of other forms of treatment. Thus he has seen irradiation with ultra-violet light succeed occasionally when iontophoresis had failed.

BLATT (26, **Digestive treatment of corneal scars**) after some experiments *in vitro* which showed a distinct digestive action by a three per cent solution of pepsin and hydrochloric acid, tried the solution on rabbits and found that instillation into the conjunctival sac and injection into the substance of the cornea produced no bad results. Instillation into the conjunctival sac of men with leucomata proved inefficient. Of four injections into the cicatricial corneæ of men, two failed, and in two a clear spot was caused, which could be made use of after an iridectomy. No harm resulted in any case.

GIFFORD (28, **Some facts about salicylate therapy**) has found no satisfactory explanation for the beneficial effects of salicylates in ocular disease. Large doses must be given because the drug is quickly eliminated in the urine. 60-90 grains a day may be given even for months. If the stomach rebels the drug may be administered per rectum. Cincophen and neocincophen have been substituted in some cases especially where salicylates produce gastric irritation. He has found a salicyl but no free salicylic acid in the aqueous. No greater amount of salicyl could be obtained from the inflamed eye of a rabbit than from the normal eye.

FUCHS (27, **Fifty enucleations with Seidel's infiltration anæsthesia**) reports the results as very good. Anæsthesia is secured by five instillations of a 10% solution of cocaine into the conjunctival sac. Then an injection of $\frac{1}{2}$ ccm of a 1% solution of novocaine with adrenalin is made subconjunctivally about the limbus. Five minutes later four injections are made with a needle 5cm long of 2ccm of a 1% solution of novocaine into the orbit, the point of the needle being gradually advanced to midway between the foramen opticum and the entrance of the optic nerve. The operation is begun twenty minutes later, and performed under complete anæsthesia. After pain appeared in sixteen per cent. of the cases, headache in twenty-four per cent.

HAAB (29, **How one can study his own eye, the cornea, lens, and anterior part of the vitreous**) for this purpose places a lens of twenty-five or thirty diopters, with a concave mirror of about 16cm focus behind it, in front of a corneal microscope provided with cross slits. If one looks into this apparatus, and has his own eye illuminated with Gulstrand's slit lamp,

he can obtain, after a careful adjustment, a good picture of the cornea, can see the nerve fibers and, when the light is very oblique, the honeycomb appearance of the endothelium. Naturally the picture is monocular. The pupil needs to be dilated for examination of the lens, and also for the rather more difficult investigation of the anterior part of the vitreous, for which a lens of ten or twenty diopters should be used.

JENDRALSKY (30, **Parenteral milk therapy**) reports concerning 129 cases. He concludes that good results are particularly to be expected in fresh, moderately severe cases of gonorrheal conjunctivitis, in rheumatic and traumatic iritis, and in many cases of interstitial keratitis. In the last there is relief of the subjective symptoms and of the blepharospasm. Trachoma, interstitial keratitis, and choroiditis are not essentially affected by this treatment.

LIEBERMANN (31, **Treatment of eye diseases, especially gonorrheal ophthalmia, with injections of milk**) finds that in the majority of cases of gonorrheal conjunctivitis the benefit is to be noted on the day following the second injection of milk. The secretion and the chemosis subside, and thus the cornea is protected. In lymphatic keratitis the irritation is reduced by the milk injections, while in interstitial keratitis the efficiency of the specific treatment applied at the same time is increased.

MANS (32, **Treatment of scrofulous eye diseases with injections of milk**) uses cow milk which has been boiled for three minutes in doses of 1ccm in infants, 6ccm in children of thirteen, and 10ccm in adults, injected intragluteally. These doses are repeated from two to six times. The photophobia and blepharospasm almost always disappear five or six hours after the injection, and this improvement often persists, going on in many previously obstinate cases to a quick recovery. He asserts that the milk cannot be replaced by an artificial preparation, and has the impression that the fever produced is of essential importance to the result.

SANDMANN (33, **Protein body therapy in ophthalmology**) finds that very good results are obtained in two thirds of the cases of conjunctivitis of infants and of adults. He never saw any benefit in chronic uveitis. In acute iritis there is only slight objective improvement, but almost always the

subjective troubles are relieved, though often for only a short time. He advises care in cases of scrofulo-tuberculous children, as in them the general reaction is often great.

WIESE (36, **Milk injections in eye diseases**) does not consider the febrile reaction essential to success. His clinical results were good in acute iritis, but not in syphilitic iridocyclitis. In scrofulous eyes he often observed improvement as regards the secretion, the photophobia, and the subjective symptoms, but usually with no permanent benefit. In corneal ulcers and eye infections the result was very variable. Trachoma is essentially obstinate. Finally he comes to the conclusion that injections of milk should be confined to very serious cases of disease, as it is a heroic remedy, and that it should not be relied upon alone, but used in conjunction with other treatment. Even though he saw no specially good results he thinks the attempt to combine this with the specific treatment of bad cases of tuberculosis and syphilis of the eye justified.

VOGT (35, **Erroneous diagnoses with the slit lamp microscope**) distinguishes between the errors that are made through a faulty condition or use of the apparatus, and those caused optically within the media. The latter he considers at some length. Among the large number of phantoms which appear in the focal light are the sharply defined shadows in the cornea which are formed behind every vessel, every foreign body or infiltrate. Likewise shadows appear in the lens behind remains of pigment, of circumscribed opacities. Occasionally bits of mucus on the cornea may simulate deposits or blebs on the posterior surface of the cornea. He then describes quite a number of hitherto unreported reflexes from the optical surfaces, diffuse reflections from them and from the parenchymata. Errors caused by refraction are explained partly by the layer of fluid, which often accumulates between the margin of the lid and the cornea and distorts the relief of the iris, and make the cornea toward the lower limbus appear thicker than it really is. Even in localization of depth, as of lenticular opacities, the refraction may cause mistakes. Finally Vogt warns against an overestimation of the value of the slit lamp microscope, through which considerable errors may be made, and especially warns beginners against the use of great enlargements.

III.—ANATOMY, PHYSIOLOGY, PATHOLOGY.

37. APEL. Monolateral congenital anophthalmos. *Berl. klin. Wochenschr.*, lviii., p. 917.
38. ASK, FRITZ, and VAN DER HOEVE, J. Development of the canaliculi under normal and abnormal conditions. *Arch. f. Ophthalm.* cv., p. 1157.
39. BLATT. Diagnostic utilization of the condition of the cerebrospinal fluid in syphilitic eye diseases. *Ibid.*, cvi., p. 357.
40. CLAUSEN. Congenital aniridia and heredity. *Klin. Monatsbl. f. Augenheilkunde*, xlvii., p. 116.
41. CLAUSEN. Typical hereditary coloboma of the macula. *Ibid.*
42. FREY. Congenital membrane formation in the eye. *Ibid.*, lxvi., p. 760.
43. FRIEDE. Congenital cornea plana and its relation to microcornea. *Ibid.*, lxvii., p. 192.
44. GILBERT. Herpetic disease of the eye. *Arch. f. Augenh.*, lxxxix., p. 35.
45. HOLM. An anatomically examined case of aniridia. *Klin. Monatsbl. f. Augenheilkunde*, lxvi., p. 730.
46. IGRERSHEIMER. Pathogenesis of phlyctenular disease of the eyes. *Arch. f. Ophrenheilkunde*, cv., p. 640.
47. IGRERSHEIMER. Syphilis of the visual apparatus. *Klin. Monatsbl. f. Augenheilkunde*, August-September, 1921, pp. 317 and 338.
48. KRAUPA, E. and M. Physiognomy of congenital syphilis. *Zentralbl. f. inn. Med.*, xli., No. 50.
49. MAGITOT, A. P. How to know the blood pressure in the vessels of the retina. *American Journal of Ophthalmology*, October, 1922.
50. MOORE, R. FOSTER, LANG, BASIL T., NEAME, H., and DOYNE, P.G. Some causes of amaurosis in infants. *British Journal of Ophthalmology*, August, 1922.
51. SCARLETT, H. W. Opaque canal of Cloquet with persistent hyaloid artery. *American Journal of Ophthalmology*, December, 1922.
52. SCHOTT. Coloboma of the macula. *Klin. Monatsbl. f. Augenheilkunde*, lxvii., p. 415.

APEL (37, Monolateral congenital anophthalmos) describes an infant born with one eye perfectly normal and the other one absent. No other malformations could be found. The lids on the side of the anophthalmos were developed, but the palpebral fissure was so narrow that they could not be separated. The entire absence of an eyeball was therefore determined wholly by palpation, which revealed no trace of even a rudimentary eyeball. As there were no other disturbances of development of the skull, especially no signs of a mechanical

hindrance to the development of a rudiment of an eye, the cause was assumed to be an embryonic anomaly.

ASK and VAN DER HOEVE (38, **Development of the canaliculi under normal and abnormal conditions**) observed a case of oblique cleft of the face with coloboma of the lower lid in which the lower punctum lay on the lateral side of the coloboma while the caruncula was in its normal position. The question was how the lower punctum came to be on the temporal side of the coloboma. Ask went back to and completed his former embryological studies of the development of the canaliculi, and concluded that the epithelium of the margin of the lid takes no active part in the formation of the punctum. He confirmed the statement that the caruncle comes wholly from the lower lid, from embryonal rudiments of the cilia and Meibomian glands which become as it were cut off from the rest of the epithelial rudiments of the margin of the lower lid by the rudiment of the canaliculus inserted fairly far laterally. Thus the development of the caruncle and of the lower canaliculus are closely connected. The presence of the punctum and a portion of the canaliculus on the temporal side of the coloboma could be explained only through a secondary division of it from the epithelial rudiment of the canaliculus growing out from the lacrimal passage. In this case the cause of the cleft appeared to be an amniotic cord. The proximal end of the canaliculus opened in the palpebral fissure, the distal end was blind within the callosities formed by the amniotic cord.

CLAUSEN (40, **Congenital aniridia and heredity**) describes a family of eight living brothers and sisters, seven of whom had congenital aniridia. The father also had aniridia. Almost all had the syndrome of cataract, glaucoma, and nystagmus. In another family with equally marked heredity of aniridia and cataract he found some relatives in whom the iris defect was confined to the mesoderm, while the pigment epithelium seemed macroscopically to be intact. In one case there was simply a coloboma of the iris at the typical place. In several cases the vision was greatly improved after extraction of the usually badly fastened lens; in one it became $\frac{1}{8}$ after correction. Clausen thinks the cause of aniridia is primarily a lack of mesoderm, and not an arrest of development of the ectoderm. But the abnormal behavior of the lens and zonula

are not taken into account in this assumption. Slight anomalies in the fovea were not excluded. Unfortunately no notes were taken of the behavior of the sphincter pupillæ in the cases with apparently intact pigment epithelial layer of the iris.

In this case HOLM (45, **An anatomically examined case of aniridia**) found the fovea centralis absent, but demonstrated a distinctly marked area, characterized by a thickening of the ganglion cell layer, in which the cones were thicker than normal, the outer granular layer correspondingly thinner, and the oblique course of Henle's layer of fibers absent. In other respects, aside from the rudimentary iris and an abnormally small lens, the eye appeared to be normal.

CLAUSEN (41, **Typical hereditary coloboma of the macula**) reports a condition of this nature found in a father and a son. The papilla of the father was completely surrounded by medullated nerve fibers. This coupling of anomalies seems to Clausen to exclude inflammation as a cause of coloboma of the macula, while it favors the assumption that the malformation is a hereditary anomaly.

SCHOTT (52, **Coloboma of the macula**) observed coloboma of the macula in two sisters, whose parents had normal eyes. In each of the four eyes there was at the posterior pole a peculiar oval, and these were placed symmetrically in each pair of eyes. These ovals presented the usual appearance of coloboma of the macula, sharply defined borders, proliferation of pigment, places without pigment, and a slight excavation of the base. Central vision varied from $\frac{3}{8}$ to $\frac{5}{8}$. An inflammatory origin seems to be excluded in these cases, the same as in Clausen's. Elschnig's explanation of the origin of atypical colobomata, that they are due to a growth of parts of the optic vesicle in an abnormal direction, seems to Schott the most nearly satisfactory, but he suggests that the possibility of an early destruction of already formed elements should be taken into account.

In the case described by FREY (42, **Congenital membrane formation in the eye**) there was an extremely delicate red brown membrane attached to the ciliary body by four offshoots. During movements of the eyeball the membrane would fall into the anterior chamber, and then suddenly back into the vitreous. Movements were made also while the eye was quiet.

FRIEDE (43, **Congenital cornea plana and its relation to microcornea**) presents the following changes as characteristic of congenital cornea plana. (1) Abnormal flatness of the cornea and of the neighboring sclera. (2) Indistinct limbus because of encroachment of the sclera upon the cornea. (3) Corneal refraction of 28 to 29 D on the average. (4) Corneal radius of about 10mm. (5) Total refraction from 7 to 9 D hypermetropia. These characteristics suffice for differentiation from true microcornea, which is always associated with microphthalmos. Cornea plana is to be regarded as a circumscribed inhibition of development of the mesoderm of the anterior segment of the eyeball, microcornea and microphthalmos of the entire eyeball.

SCARLETT (51, **Opaque canal of Cloquet with persistent hyaloid artery**) describes a rather usual case of this anomaly. A light bluish-gray stalk attached to the nerve-head came forward into the vitreous well up to the temporal side of the lens. It contained the artery which was filled with blood. There were vessels on the surface which came from the central artery or the disk. A large irregular patch of connective tissue was seen in the retina and several areas of disturbance of choroidal pigment. The vision was reduced to light perception.

This research, which was begun in 1913, has been carried on by succeeding Lang scholars at Moorfields Eye Hospital. MOORE, LANG, NEAME and DOYNE (50, **Some causes of amaurosis in infants**). Infants with very deficient or absent sight are comparatively common features of a large ophthalmic clinic. The question of prognosis in these cases is of the greatest importance. In this paper some 60 cases have been noted and followed up for some considerable time. The cases were carefully selected so that no doubt as to their eligibility could be entertained. Then a very thorough examination along a routine plan was carried out. After which the cases were watched, attending the hospital at definite intervals. Of the 60 cases, 19 proved to be mentally defective. This is the largest grouping. These children in nearly all cases developed a certain amount of sight. It would appear that the condition was attributable to a defect of the higher cerebral centers. No local signs or changes were observed in the eyes themselves. The next largest grouping is that of Albinism, 17 cases. These

children all eventually developed fair vision. The pigment deficiency of the retina and choroid appears to delay or stultify the development of macula fixation. These two groupings comprise a large proportion of the cases investigated. Five cases of temporary amaurosis were observed. The condition was in all probability associated with a mild attack of meningitis. These cases recovered their vision, in some instances with great rapidity. Of the other cases 7 were due to cataract, 7 to fundus disease and 5 to gross refractive errors. Many other interesting points were investigated;—the question of consanguinity of the parents, the position of the infant in the family, congenital syphilis and premature birth. Of these factors it may be said that no very definite correlation with the amaurosis was established. Associated features such as head nodding, eye rubbing and nystagmus were noted. Here again no definite correlations were made out. Eye rubbing however seemed usually to be associated with some local defect of the eyeball.

MAGITOT (49, **How to know the blood pressure in the vessels of the retina**) gives further details of the work done by Bailliant and himself. He makes the following statements: The intraocular arterial pressure is normally higher than the ocular tension. The venous pressure is not always as great as the ocular pressure. In order that pulsation may appear in the arteries and veins of the disk it is necessary that the pressure exerted by the ocular tension on the walls of the vessels should balance the pressure of the blood column. In cases of normal general pressure the ratio between the local arterial pressure and the general pressure is as 0.45 is to 1. The Bailliant pressure gauge, which is used during these experiments, consists of a cylinder containing a spring. The pressure is recorded through a rod which projects from the cylinder and is held in contact with the eyeball. He thinks many valuable deductions can be drawn from these observations.

BLATT (39, **Diagnostic utilization of the condition of the cerebrospinal fluid in syphilitic eye diseases**) comes to the following conclusions: (1) A positive Wassermann of the cerebrospinal fluid can not only settle the diagnosis of a syphilitic neurologic eye disease, but in many cases aids much in locating the central or nerve lesion which is the cause of the

ocular change. (2) A positive result from the cerebrospinal fluid can always be utilized, a negative only when the blood Wassermann is positive. (3) A positive result indicates unquestionably syphilitic disease of the central nervous system, but a negative result does not contraindicate it. (4) A positive Wassermann of the cerebrospinal fluid does not indicate that a disease of the central nervous system is to be expected at some time in the future, but it shows that a syphilitic disease of the central nervous system is actually present at the time, even though it may not yet have manifested any clinical symptoms.

IGERSHEIMER (47, **Syphilis of the visual apparatus**) has been studying the question of spirochætæ in interstitial keratitis in five or six hundred syphilitic animals. Fifty-four of these had metastatic interstitial keratitis, although other symptoms of syphilis were not found in the eyes, with the exception of an occasional iritis. In the fresh cases with commencing cloudiness of the cornea he found spirochætæ almost wholly in the posterior third of the clear segment of the cornea free from inflammation. In the older stages there was a deep seated opacity of the cornea which appeared anatomically as a new formation on the posterior surface, consisting of endothelogenous connective tissue with lymphocytes, and occasionally leucocytes. As long as these eyes were inflamed spirochætæ were always demonstrable in large numbers, but not in the cornea itself, in this posterior formation. As the spirochætæ almost always lay in the posterior layers of the cornea throughout the various stages, Igersheimer experimented by injecting into the anterior chamber a new preparation of salvarsan, with good results.

Igersheimer has also investigated fourteen cases of progressive paralysis, seven of which had optic atrophy, from the eyeball to the corpus geniculatum, but was not able to detect any surely spirochætic condition in the optic tract. Cords said in the discussion of this paper that his investigations along the same line had been with negative results. Bergell claimed that the reason why spirochætæ could not be demonstrated in the freshly inflamed areas of the cornea was that the fatty capsules of the spirochætæ, upon which their staining depends, are dissolved by the action of ferments.

KRAUPA (48, **Physiognomy of congenital syphilis**) makes the point that the present generation of physicians is inclined to rest the diagnosis of congenital syphilis upon the outcome of the serological reactions, and to pay too little attention to the clinical picture. But as the Wassermann reaction proves negative in quite a large percentage of unquestionable cases of congenital syphilis, and as one of the signs pertaining to the eye of Hutchinson's triad is very often not present, it would be well to utilize more than is usual other signs of congenital syphilis in making the diagnosis. Among the signs enumerated are the formation of the skull, the form of the upper jaw and of the chin, abnormalities in the shape of the nose, the protean malformations of the teeth, the color of the face, the shape of the cornea and the color of the iris.

GILBERT (44, **Herpetic disease of the eye**) describes the histological condition in a case of herpes zoster trigemini which had lasted two or three weeks. The eyeball and contents of the orbit were removed twenty-four hours after death. He found a neuritis and perineuritis of the ciliary nerves on each side of the ciliary ganglion, which could not be examined, round cell infiltration of the choroid, episclera and conjunctiva in the immediate neighborhood of the inflamed nerve twigs. He concludes that herpetic keratitis and uveitis are inflammations introduced by way of the nerves which may, but does not necessarily, induce necrosis of the uvea. Likewise he considers herpetic corneal disease as a corneal neuritis.

IGERSHEIMER (46, **Pathogenesis of phlyctenular disease of the eyes**) has investigated the later fate as regards tuberculosis of ninety-two patients who had suffered from scrofulosis of the eye. Tuberculosis of the adult eye develops later in such cases comparatively rarely. An active process in the lungs was demonstrable in thirteen per cent., and a like percentage of healed conditions in the lungs was found. Altogether their findings would seem to indicate that the occurrence of a scrofulous disease in childhood may exert a certain protection against active tuberculosis later, or at least against its malignant course.

(To be continued.)

BOOK REVIEWS.

XIII.—**The Principles and Practice of Perimetry.** By Dr. LUTHER C. PETER. II. edition, 281 pages, published by Lea & Febiger, Philadelphia and New York, 1923. Price \$4.00.

This second edition of Dr. Peter's well-known book has been almost entirely rewritten and brought up to date. It is considerably larger than the first edition, and contains many new illustrations. A clear and concise description of the anatomy and physiology of the visual pathway is given, as well as the physical and physiological principles which underlie field taking, such as central and indirect vision, visual acuity, laws of projection and direction, corresponding retinal points, etc. The most important changes, however, are to be found in Part III, on Methods, Technic, Instruments and Charts, and in Parts IV and V, on General Pathology of the Visual Field and Special Pathology of Fields, respectively. In Section III the author carefully describes in considerable detail not only his own methods of field taking and scotometry and the instruments used by him, but also the methods and instruments in use by other leading specialists in this line of work. Simple instructions are also given for the construction of tangent screens, and to assure accuracy in their construction, a table of natural tangents is given. These instructions should be welcomed by most ophthalmologists, for a tangent screen is now a necessity in every well-equipped office, and can be constructed at a trifling cost. In this chapter Dr. Peter also emphasizes the importance of qualitative perimetry and scotometry, a very important but almost unexplored field. Only on one point are we inclined to differ with the author, and that has to do with the size of test object used in his scotometric work. The doctor uses a comparatively large object and states on page 94 that a thirty-minute object is the most

suitable for measuring any scotoma in the central area. Such an object used at one meter would measure 8.7mm in diameter. With an object of this size we have never been able to detect early changes about the blind spot in glaucoma and toxic amblyopia as well as with a 1mm object, even when qualitative scotometry was resorted to. In the chapters on General and Special Pathology of Fields the author gives a very comprehensive review of our present knowledge concerning field defects and their relation to disease.

The book is comprehensive and well written, and should find a place in the library of every ophthalmologist. As in the previous edition, a complete bibliography is appended, which greatly enhances the value of the book. A. H. T.

XIV.—Report of the Government Ophthalmic Hospital, Madras, India, for 1922. By Major R. E. WRIGHT, I.M.S., Madras, India, 1923.

The annual report of the Madras Eye Hospital for 1922 shows that 4031 in-patients and 20,139 out-patients were treated. 1571 cataract extractions were made, generally by the usual capsulotomy method, though the Barraquer operation was attempted in 250. The cataract was delivered in its capsule in 168 cases; in 76 it failed; vitreous escaped in 23. The author thinks that the Barraquer operation is probably the best intracapsular method in selected cases. It is not justified in—a. bulging eye, b. friable capsule, c. immature cataract with a normal suspensory ligament, d. Morgagnian cataract. In the use of the suction cup the beginner runs the risk of getting entangled in the iris. The writer furthermore believes that the vitreous deprived of its support from the suspensory and capsule is in a menaced position and permits the invasion of the vitreous by all elements that give rise to vitreous opacities which, if of an organized type, tend to be progressive and incurable. The reviewer, who has been practicing a modified intracapsular method for 12 years and has had repeated opportunity of observing the late results of his cases, has not been able to confirm these vitreous changes. 187 sclero-corneal trephinings were performed. 2350 were refraction cases, and there were 213 fundus disease cases. In the large out-patient service there occurred 9 cases of spring catarrh, 28

of macular keratitis (Kirkpatrick), 477 of ulcus serpens, and 56 of keratomalacia. An interesting observation was that in 5 of 12 Morgagnian cataracts the nucleus had spontaneously been dislocated into the anterior chamber and the eyes were red and glaucomatous. The reports of a number of unusual clinical cases are appended.

A. K.

XV.—Ophthalmic Surgery. By Professor JOSEF MELLER. Edited by Dr. W. M. SWEET, Philadelphia. III. edition, 364 pages with 219 illustrations, Philadelphia, Pa., published by Blakiston's Son & Co., 1923. Price \$5.00.

The wish expressed in the review of Professor Meller's *Augenärztliche Eingriffe* in the ARCHIVES, 1921, that an early translation in English was to be desired, has now been fulfilled, and English-reading ophthalmologists are indebted to Dr. Sweet for making this excellent book available to a larger circle of readers. The subject matter is rearranged, but no change is found in the text. The American edition is dedicated to the Rockefeller Foundation in gratitude for the support it granted to the medical faculties of the Austrian universities during their years of distress. The translation has been well done and the book will be of great assistance to those studying this branch. It must be remembered that though it gives only a description of the methods used in one eye clinic, as is specifically stated, it gains by concentration and the methods described are all approved as they have been slowly evolved and found adequate during many years of trial.

A. K.

XVI.—Senile Cataract. Methods of Operating. By Dr. W. A. FISHER, Chicago. 250 pages, published by Chicago Eye, Ear, Nose, and Throat College, Chicago, 1923. Price \$2.50.

Dr. Fisher has written in collaboration with a number of eminent operators a description of the various ways to operate for cataract which are at the present time in favor. The capsulotomy operation is taken up by Professor Fuchs of Vienna and Colonel Henry Smith, now in London. The intracapsular method is described by Professor Barraquer of Barcelona, Colonel Henry Smith, Dr. H. T. Holland of Shikarpur Lind, India, Dr. J. W. Wright of Akron, Ohio, and

by Dr. W. A. Fisher. A chapter is added on practice on kitten's eyes which Dr. Fisher has shown to be admirably adapted to acquire the technic of the incision, the iridectomy, and the important procedures with the spoon in presentation or loss of vitreous and with the needle. The book is well illustrated with many pictures. While the views of many of the writers have been published before, it is a convenience to have them now appear in a single volume as the subject is still of the greatest interest to ophthalmologists.

A. K.

XVII.—*Taschenbuch der Augenheilkunde*, for Physicians and Students. By Professor Curt Adam, Berlin. V. edition, 394 pages, 72 illustrations, published by Urban & Schwarzenberg, Berlin and Vienna, 1923. Price 9.60 francs (Swiss).

Adam's manual now appears in a fifth edition which has been carefully revised, and new matter has been added in the form of foreign protein therapy, light therapy, tuberculin treatment, differential diagnosis, and medical ophthalmology. This is an excellent short treatise containing the essential, with especial consideration of treatment.

A. K.

ERRATUM.

Dr. R. G. Reese has drawn attention to an error on page 375 in the July issue, where an operation for ptosis was described as a modified Machek operation instead of one which was original with him. A full description of this method will appear in the next number of these ARCHIVES.

OBITUARY.

CARL HESS died on June 28th from pernicious anæmia at the age of sixty. The only son of a prominent ophthalmologist (a close friend of A. von Graefe and long-time secretary of the German Ophthalmological Society), he early turned to ophthalmology and soon became assistant to Sattler in Prague, where he came under the influence of Hering, who was then director of the physiological laboratory in the German University. Hess acted as Hering's assistant for a time and later moved to Leipzig with Sattler and Hering, and in 1891 became first assistant in the Leipzig Eye Clinic and privat-docent. His scientific work began with physiological investigations of the color and light senses, with experiments on retinal fatigue, hemeralopia and adaptation, and color-blindness. These were extended later to the study of the phenomena in the animal kingdom. He also published clinical contributions on fascicular keratitis, on the cause of striped keratitis after cataract extraction, and a new ptosis operation. In 1896 he was called as professor to Marburg and in 1900 to Würzburg.

The subjects of accommodation and pupillary movement also engaged his attention. His rejection of partial contraction of the ciliary muscle and demonstration of the correctness of the Helmholtz theory are well known. The study of the pupil led to the construction of apparatuses which are of clinical utility,—the hemikinesimeter for diagnosis of tract lesions and differential pupilloscopy for topical analysis of pupillary disturbances. The pathogenesis of cataract was studied and a fundamental lesion of the capsular epithelium emphasized. During this period he wrote two large textbooks,—one on *Anomalies of Refraction and Accommodation*

and one on the Pathology and Therapy of the Lens—and continued his studies on comparative physiology of light and color senses and the mechanism of accommodation in the animal kingdom. The spring vacation was always spent in Naples, in the Zoological Institute. He branched out from the narrow confines of his specialty to the developmental problems of animal life. These studies in comparative physiology of the senses are his greatest achievement and the one through which he acquired a world-wide reputation. In Munich, notwithstanding greater demands of the clinic and consulting practice, he continued his investigations on the vision of animals. The problem of color-blindness was again taken up and new methods for its study evolved. In 1922 the German Ophthalmological Society bestowed the Graefe medal on him, an honor which he shared with Helmholtz, Leber, and Hering, and he was elected Doctor of Philosophy (*honoris causa*) by the Faculty of Natural Sciences at Göttingen.

His many contributions are surely astounding and only possible in one who combined to a marvelous degree unusual endurance, great facility in working, and a keen power of observation. His writings are characterized by originality of thought and lucidity of style, while his physiological experiments are based on new and ingenious methods of examination. He possessed a remarkable and exuberant vitality. His visit to this country in 1907, on the invitation of the Section on Ophthalmology of the A.M.A., will always be remembered by the many who then made his acquaintance. He gave an address on the Modern Views of the Physiology and Pathology of Accommodation, which was published in the *Transactions*. In 1905 he succeeded Schweigger as editor of the *Archiv für Augenheilkunde*, the German edition of these ARCHIVES. His death in the prime of his scientific life is a great loss to ophthalmology.

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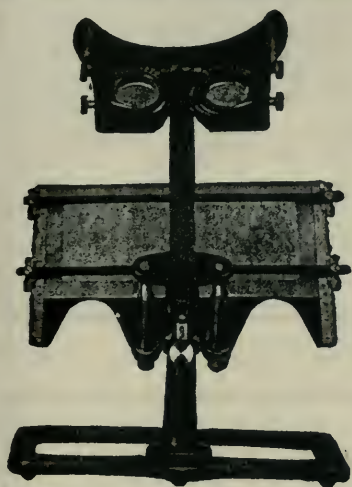
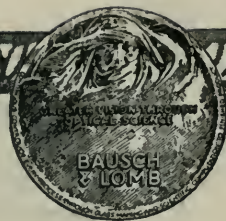
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